

**TELANGANA STATE BOARD OF INTERMEDIATE EDUCATION, HYDERABAD**

**VOCATIONAL BRIDGE COURSE**

**BOTANY– First Year (w.e.f. 2016-2017)**

**SCHEME AND WEIGHTAGE**

1. The Question paper is to be set for 40 (Forty) marks. The student has to answer for 25 (Twenty five) marks.
2. There will be 8 (Eight) Very Short Answer Questions each carrying 1 (One) Mark. The student has to answer 5 questions from this Section-A.
3. In Section-B there will be 8 (Eight) Short Answer Question each carrying 4 (Four) Marks. The student has to answer 5 questions from this Section-B.

**Weightage for the Chapters included in the Syllabus is as follows:**

<b>S.No.</b>	<b>Unit</b>	<b>Number of Periods</b>	<b>Weightage of Marks</b>
1.	Diversity in Living Word	15	05
2.	Morphology	08	08
3.	Reproduction in Plants	07	06
4.	Plant Systematics	05	02
5.	Cell Structure and Functions	07	10
6.	Anatomy	06	08
7.	Plant Ecology	02	01
<b>Total</b>		<b>50</b>	<b>40</b>

**TELANGANA STATE BOARD OF INTERMEDIATE EDUCATION, HYDERABAD**

**VOCATIONAL BRIDGE COURSE**

**BOTANY – First Year (w.e.f. 2016-2017)**

**MODEL QUESTION PAPER**

**Time: 1 ½ Hours**

**Max.Marks: 25**

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**Section – A**

**5x1=5**

**Note:**

- i) *Answer any **five** of the questions briefly*
  - ii) *Each question carries **one** mark.*
1. Give the scientific name of mango?
  2. Define Vivipary?
  3. What is Vegetative propagation?
  4. Write the floral formula of Solanum plant?
  5. Give the technical description of anther of Allium Cepa.
  6. Which tissue of plants exhibit meiosis?
  7. What is middle lamella made of?
  8. Define Sciophytes?

**Section – B**

**5x4=20**

**Note:**

- i) *Answer any **five** questions*
  - ii) *Draw labelled diagrams wherever necessary*
  - ii) *Each question carries **four** marks.*
9. What is heterospory? Give its significance?
  10. Define Venation? How do dicots differ from monocots with respect to venation?
  11. Explain any four stem modification with examples?
  12. Explain Binomial Nomenclature?
  13. Describe the structure and functions of Power houses of cell?
  14. Explain Prophase I of meiosis?
  15. Describe in briefly the internal structure of Dicot root?
  16. Write briefly about different types of meristems?

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**VOCATIONAL BRIDGE COURSE**

**BOTANY – First Year (w.e.f. 2016-2017)**

**QUESTION BANK**

**Unit-I: DIVERSITY IN THE LIVING WORLD**

***Very Short Answer Questions (1 Mark)***

1. What does ICBN stand for?
2. Which is the largest botanical garden in the world?
3. Name a well known botanical garden in India.
4. What is the basic unit of classification?
5. Give the scientific name of Mango.
6. How are Viroids different from Viruses?
7. Who proposed five kingdom classification?
8. Name two diseases caused by Mycoplasmas.
9. Who is popularly known as father of Botany?
10. Who discovered the cell?
11. What is Palaeobotany?
12. What are the groups of plants that live as symbionts in lichens?
13. Name the study of lichens.
14. Which group of plants is called amphibians of plant kingdom?
15. Name the branch of Botany which deals with amphibians of plant kingdom?
16. What is the basis of classification of Algae ?
17. What are the two stages found in the gametophyte of mosses ?
18. Name the Gymnosperms which contain mycorrhiza
19. Name the corolloid roots respectively.

***Short Answer Questions (4 Marks)***

20. What are taxonomical aids? Give the importance of herbaria and museums.
21. Explain binomial nomenclature.

22. Give the salient features and importance of Chrysophytes.
23. Give a brief account of Dinoflagellates.
24. Differentiate between red algae and brown algae
25. What is heterospory? Briefly comment on its significance. Give two examples.
26. Draw labelled diagrams of female thallus and male thallus of a liverwort

## **Unit-II: MORPHOLOGY**

### ***Very Short Answer Questions (1 Mark)***

27. Define venation.
28. How do dicots differ from monocots with respect to venation?
29. Which organ is modified to trap insects in insectivorous plants?
30. What type of inflorescence is found in fig trees?
31. Define placentation.
32. What type of placentation is found in *Dianthus*?
33. What is meant by parthenocarpic fruit?
34. Why certain fruits are called false fruits?
35. Name two examples of plants having false fruits.
36. Name any two plants having single seeded dry fruits.
37. What are aggregate fruits? Give two examples.

### ***Short Answer Questions (4 Marks)***

38. Explain with examples different types of phyllotaxy.
39. Describe any two special types of inflorescences.
40. Describe in brief the fleshy fruits studied by you.
41. Explain how root is modified to perform different functions. ( Any Four).
42. Explain how stem is modified variously to perform different functions. (Any Four).

## **Unit-III: REPRODUCTION IN PLANTS**

### ***Very Short Answer Questions (1 Mark)***

43. What is the dominant phase in the life cycle of an angiosperm?
44. What is meant by heterospory?

45. How do Liver worts reproduce vegetatively?
46. Between an annual and a perennial plant, which one has a shorter juvenile phase?
47. What the following parts of a flower develop into after fertilization?  
a) Ovary b) Ovules
48. Define vivipary. Give example.
49. Name the component cells of the 'egg apparatus' in an embryo sac.
50. Name the parts of pistil which develop into fruit and seeds.
51. What is self-incompatibility ?
52. Which is the triploid tissue in a fertilized ovule ?
53. How is pollination carried out in water plants ?
54. Define with examples endospermic and non-endospermic seeds.

**Short Answer Questions (4 Marks)**

55. "Fertilisation is not an obligatory event for fruit production in certain plants". Explain the statement.
56. Why is vegetative reproduction also considered as a type of asexual reproduction?
57. Give a brief account on the phases of the life cycle of an angiosperm plant.
58. What is vegetative propagation?
59. Give two suitable examples showing vegetative propagation in plants.
60. Write a brief account on agents of pollination.

**Unit-IV : PLANT SYSTEMATICS**

**Very Short Answer Questions (1 Mark)**

61. What is Natural system of plant classification?
62. Name the scientists who followed Natural System of Classification.
63. What is geocarpy?
64. Name the plant which exhibits geocarpy phenomenon.
65. Name the type of pollination mechanism found in members of Fabaceae.
66. Write the floral formula of *solanum* plant.
67. Give the technical description of ovary in *Solanum nigrum*.
68. Give the technical description of anthers of *Allium cepa*.

**Short Answer Questions (4 Marks)**

69. Describe the essential organs of Solanaceae.
70. Give economic importance of plants belonging to Fabaceae.

**Unit - V: CELL STRUCTURE AND FUNCTIONS**

**Very Short Answer Questions (1 Mark)**

71. What is the significance of vacuole in a plant cell ?
72. What does 'S' refer in a 70S & 80S ribosome ?
73. Mention a single membrane bound organelle which is rich in hydrolytic enzymes.
74. What is the feature of a metacentric chromosome ?
75. What is middle lamella made of ?
76. What is osmosis ?

**Short Answer Questions (4 Marks)**

77. Describe the cell organelle which contains chlorophyll pigments.
78. Describe the structure and function of power houses of cell.
79. Differentiate between Rough Endoplasmic Reticulum (RER) and Smooth Endoplasmic Reticulum (SER).
80. Describe the structure of nucleus.
81. What are the characteristics of a prokaryotic cell?

**Unit - VI: ANATOMY**

**Very Short Answer Questions (1 Mark)**

82. Which tissue of animals and plants exhibits meiosis?
83. If a tissue has at a given time 1024 cells. How many cycles of mitosis had the original parental single cell undergone?
84. Name the stage of meiosis in which actual reduction in chromosome number occurs.

**Short Answer Questions (4 Marks)**

85. Explain prophase I of meiosis.
86. Which division is necessary to maintain constant chromosome number in all body cells of multi cellular organism and why?

## **Unit – VII : PLANT ECOLOGY**

### ***Very Short Answer Questions (1 Mark)***

87. Why are xylem and phloem called complex tissues?
88. What is the function of phloem parenchyma?
89. What are the cells that make the leaves curl in plants during water stress?
90. Give an example.
91. Define heliophytes.
92. Define sciophytes.
93. Define population.
94. Define community
95. Hydrophytes show reduced xylem. Why?

### ***Short Answer Questions (4 Marks)***

96. State the location and function of different types of meristems.
97. What is the difference between lenticels and stomata?
98. Write the precise function of
  - a. Collenchyma
  - b. Sclerenchyma
99. What are simple tissues ? Describe various types of simple tissues
100. Describe the internal structure of dorsiventral leaf with the help of labelled diagram.
101. Describe the internal structure of an isobilateral leaf with the help of labelled diagram.
102. Describe in brief the T.S of a dicot stem.
103. Describe in brief the T.S of monocot stem.

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**BOTANY– Second Year (w.e.f. 2016-2017)**

**SCHEME AND WEIGHTAGE**

4. The Question paper is to be set for 40 (Forty) marks. The student has to answer for 25 (Twenty five) marks.
5. There will be 8 (Eight) Very Short Answer Questions each carrying 1 (One) Mark. The student has to answer 5 questions from this Section-A.
6. In Section-B there will be 8 (Eight) Short Answer Question each carrying 4 (Four) Marks. The student has to answer 5 questions from this Section-B.

**Weightage for the Chapters included in the Syllabus is as follows:**

<b>S.No.</b>	<b>Unit</b>	<b>Number of Periods</b>	<b>Weightage of Marks</b>
1.	Plant Physiology	18	10
2.	Micro Biology	06	05
3.	Genetics	04	05
4.	Molecular Biology	07	05
5.	Biotechnology	05	05
6.	Plants, Microbes and Human Welfare	10	10
<b>Total</b>		<b>50</b>	<b>40</b>



**TELANGANA STATE BOARD OF INTERMEDIATE EDUCATION, HYDERABAD**

**VOCATIONAL BRIDGE COURSE**

**BOTANY – Second Year (w.e.f. 2016-2017)**

**MODEL QUESTION PAPER**

**Time: 1 ½ Hours**

**Max.Marks: 25**

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**Section – A**

**5x1=5**

**Note:**

i) *Answer any **five** of the questions briefly*

ii) *Each question carries **one** mark.*

1. Define Water Potential?
2. Name two amino acids in which Sulphur is present?
3. What is genophore.
4. Differentiate between Homozygous and Heterozygous?
5. What is meant by Capping?
6. Expand GMO?
7. What is emasculation?
8. Give any two microbes that are useful in biotechnology?

**Section – B**

**5x4=20**

**Note:**

i) *Answer any **five** questions*

ii) *Draw labelled diagrams wherever necessary*

ii) *Each question carries **four** marks.*

9. Explain the steps involved in the formation of root nodule?
10. With the help of diagram, explain briefly the process of Cyclic Photophosphorylation?
11. Explain lytic cycle?
12. Design a test cross?
13. Write briefly about DNA Polymerase.
14. What are cloning vectors? Give an example?
15. Explain the process of biogas production?
16. What is meant by germplasm collection? Give its benefits?

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**VOCATIONAL BRIDGE COURSE**

**BOTANY – Second Year (w.e.f. 2016-2017)**

**QUESTION BANK**

**Unit – I : PLANT PHYSIOLOGY**

***Very Short Answer Questions (1 Mark)***

1. What are porins?
2. Define water potential.
3. Differentiate osmosis from diffusion.
4. Explain why xylem transport is unidirectional while that in phloem is bidirectional?
5. Does transpiration occur at night? Give an example.
6. How does ABA bring about the closure of stomata under water stress conditions?
7. How do you categorize a particular essential element as a macro or micronutrient?
8. Out of the 17 essential elements which elements are called non-mineral essential elements?
9. Name two amino acids in which sulphur is present.
10. Which element is regarded as the 17th essential element?
11. Name the essential elements present in nitrogenase enzyme.
12. Write the balanced equation of nitrogen fixation.
13. Who proposed 'Lock and Key hypothesis'?
14. Who proposed Induced fit hypothesis?
15. How many molecules of ATP and NADPH are needed to fix a molecule of CO<sub>2</sub> in C<sub>3</sub> plants?
16. What is the primary acceptor of CO<sub>2</sub> in C<sub>3</sub> plants?
17. What is first stable compound formed in a Calvin cycle?
18. What is the primary acceptor of CO<sub>2</sub> in C<sub>4</sub> plants?
19. Explain the term 'Energy currency'.
20. Explain the economic importance of fermentation.
21. What is the common pathway for aerobic and anaerobic respirations?

22. Which substance is known as the connecting link between glycolysis and Krebs cycle?
23. Explain briefly the process of glycolysis.
24. What is apical dominance?
25. What is meant by bolting?
26. What is ethephon?
27. Which of the PGRs is called stress hormone?
28. Define the terms quiescence and dormancy.

***Short Answer Questions (4 Marks)***

29. What is meant by plasmolysis? How is it practically useful to us?
30. How does ascent of sap occur in tall trees?
31. "Transpiration is a necessary evil". Explain.
32. Explain the steps involved in the formation of root nodule.
33. Write in brief how plants synthesize amino acids.
34. Explain the importance of [ES] complex formation.
35. With the help of diagram, explain briefly the process of cyclic photosynthesis.
36. Explain the structure of the chloroplast? Draw a neat labelled diagram.
37. Write a note on agricultural/horticultural applications of auxins.
38. Write the physiological responses of gibberellins in plants.
39. Write any four physiological effects of cytokinins in plants.
40. What are the physiological processes that are regulated by ethylene in plants?

**Unit – II : MICROBIOLOGY**

***Very Short Answer Questions (1 Mark)***

41. Define Microbiology.
42. What are pleomorphic bacteria? Give an example.
43. What is sex pilus?
44. What is a genophore ?
45. What is a plasmid?
46. What is its significance of a plasmid?

47. What is conjugation ?
48. Who discovered conjugation?
49. In which organism conjugation was discovered?
50. What is transformation?
51. Who discovered transformation?
52. In which organism transformation was discovered?
53. What is transduction?
54. Who discovered transduction? In which organism transduction was discovered?
55. What is the shape of T<sub>4</sub> phage?
56. What is the genetic material in T<sub>4</sub> phage?
57. What is lysozyme?
58. What is the function of lysozyme?
59. Define 'lysis'.
60. What is a prophage?
61. Give an example to prophage?

***Short Answer Questions (4 Marks)***

62. How are bacteria classified on the basis of morphology?
63. How are bacteria classified on the basis of number and distribution of flagella?
64. Explain the conjugation in bacteria.
65. Explain the chemical structure of viruses.
66. Explain the structure of TMV.
67. Explain the lytic cycle in viruses.

**Unit – III : GENETICS**

***Very Short Answer Questions (1 Mark)***

68. What is the cross between the F<sub>1</sub> progeny and the homozygous recessive parent called?
69. Explain the terms phenotype and genotype.
70. What is the genetic nature of wrinkled phenotype of pea seeds?

**Short Answer Questions (4 Marks)**

71. Mention the advantages of selecting pea plant for experiment by Mendel.
72. Differentiate between the following:
  - (a) Dominant and Recessive
  - (b) Homozygous and Heterozygous
73. Explain the Law of Dominance using a monohybrid cross.
74. Define and design a test-cross.

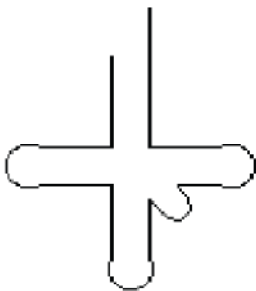
**Unit - IV: MOLECULAR BIOLOGY**

**Very Short Answer Questions (1 Mark)**

75. Distinguish between heterochromatin and euchromatin.
76. What is the function of DNA polymerase?
77. What are the components of a nucleotide?
78. What are the components of a transcription unit?
79. What is the difference between exons and introns?
80. What is meant by capping and tailing?
81. Define peptide bond.
82. What is the function of the codon- AUG?
83. Define stop codon. Write the codons.

**Short Answer Questions (4 Marks)**

84. Write briefly about DNA polymerase.
85. On the diagram of the secondary structure of tRNA shown below indicate the location of the following features:



- a) Anticodon b) Acceptor stem c) Anticodon stem d) 5' end e) 3' end

86. What are the differences between DNA and RNA.
87. Write the important features of Genetic code?

## **Unit – V: BIOTECHNOLOGY**

### ***Very Short Answer Questions (1 Mark)***

88. What are molecular scissors?
89. What is EcoR1?
90. What are cloning vectors?
91. What is palindromic sequence?
92. What is the full form of PCR?
93. How is PCR useful in biotechnology?
94. How can you differentiate between exonucleases and endonucleases?
95. Expand GMO.
96. Give different types of *cry genes*.
97. Name the nematode that infects the roots of tobacco plants.

### ***Short Answer Questions (4 Marks)***

98. Write short notes on restriction enzymes.
99. What are the different methods of insertion of recombinant DNA into the host cell?
100. Give a brief account of
  - A) Bt. cotton
  - B) Pest resistant plants

## **Unit – VI : PLANTS, MICROBES AND HUMAN WELFARE**

### ***Very Short Answer Questions (1 Mark)***

101. Name two semi-dwarf varieties of rice developed in India.
102. Give two examples of wheat varieties introduced in India.
103. What is emasculation?
104. Which two species of sugarcane were crossed for better yield?
105. Why does 'Swiss cheese' have big holes.
106. Name the bacteria responsible for big holes in 'Swiss Cheese'.

107. What are fermentors?
108. Name a microbe used for statin production.
109. What is *Nucleopolyhedrovirus* is being used for now a days?
110. Give any two microbes that are useful in biotechnology.
111. Name any two genetically modified crops.
112. Which species of *Penicillium* produces Roquefort cheese?
113. Name any two industrially important enzymes.
114. Give an example of a rod shaped virus.
115. What is the group of bacteria found in both the rumen of cattle and sludge of sewage treatment?
116. In which food would you find lactic acid bacteria?
117. Name the lactic acid producing bacterium.
118. Name any two fungi which are used in the production of antibiotics.
119. Name the scientists who were credited for showing the role of penicillin as an antibiotic.

**Short Answer Questions (4 Marks)**

120. What is meant by germplasm collection? What are its benefits?
121. The culture medium (nutrient medium) can be referred to as a 'highly enriched laboratory soil'. Justify the statement.
122. Give few examples of biofortified crops. What benefits do they offer to the society?
123. How is *Bacillus thuringiensis* helpful in controlling insect pests?
124. What is the chemical nature of biogas? Explain the process of biogas production.
125. Which bacterium has been used as a clot buster? What is its mode of action?
126. What are biofertilisers? Give two examples and discuss their role as biofertilisers.

**TELANGANA STATE BOARD OF INTERMEDIATE EDUCATION, HYDERABAD**

**VOCATIONAL BRIDGE COURSE**

**BOTANY PRACTICALS - (w.e.f. 2016-2017)**

**WEIGHTAGE OF MARKS**

<b>S.No.</b>	<b>Chapter</b>	<b>Number of Periods</b>	<b>Weightage of Marks</b>
1.	Anatomy	04	05
2.	Taxonomy	02	04
3.	Experiments (Physiology, Ecology)	06	06
4.	Spotter/Slides	06	06
5.	Record and Herbarium	02	3+2 = 05
<b>Total</b>		<b>20</b>	<b>25</b>



**TELANGANA STATE BOARD OF INTERMEDIATE EDUCATION, HYDERABAD**

**VOCATIONAL BRIDGE COURSE BIOLOGICAL SCIENCE**

**BOTANY PRACTICALS – (w.e.f. 2016-2017)**

**MODEL QUESTION PAPER**

**Time: 3 Hours**

**Max.Marks: 25**

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1. Take the T.S. of the given material 'A' and prepare a slide. Identify the material with suitable reasons. Draw a neat labeled diagram.

**5 Marks**

2. Describe the identifying features of plant material 'B' and identify it upto family level, by giving reasons. Draw L.S. of flower, Floral diagram and write floral formula.

**4 Marks**

3. Conduct the given experiment 'C'. Comment on the results and their significance.

**5 Marks**

4. Identify the Spotters/Slides D, E and F (2 x 3)

**6 Marks**

5. Record (3 marks) and Herbarium (2 marks)

**5 Marks**

**TELANGANA STATE BOARD OF INTERMEDIATE EDUCATION, HYDERABAD**

**VOCATIONAL BRIDGE COURSE SYLLABUS**

**BOTANY PRACTICALS – (w.e.f. 2016-2017)**

**QUESTION BANK**

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**Section - A**

**Anatomy:** Section Cutting of the following plant material and preparation of slide.

Monocot Root eg. Crinum

Dicot Root (Primary) eg. Cicer/Trigonella Seedling

Mono Stem eg. Grass

Dicot Stem (Primary) eg. Tridax

**Section - B**

**Taxonomy:** Description of the family. Vegetative and Floral Characters that are necessary for Identification of the Family Fabaceae, Solanaceae, Liliaceae.

**Section - C**

**Physiology Experiments:**

1. Determination of transpiration by Cobalt Chloride method.
2. Study of Plasmolysis (by Rheo discolor peels or by grapes)
3. Determination of Osmotic Potential (by Potato Osmometer)

**Section - D**

**IV. Spotters/Slides Identification: (One Spotter from each section)**

**Section – D**

1. Tuberos Root – eg. Carrot
2. Epiphytic roots – eg: Vanda.
3. Phylloclade – eg. Opuntia
4. Rhizome – eg. Zinger
5. Corm – eg. Colocasia
6. Bulb – eg. Onion

7. Insectivorous leaf – eg. *Nepenthes*
8. Hypanthodium – eg. *Ficus*
9. Spadix – eg. *Colocasia*
10. Drupe – eg. Mango
11. Hesperidium – citrus

#### **Section – F**

12. *Funaria* plant with saprophyte
13. *Selaginella* – Plant
14. *Cycas* – microsporophyll
15. *Cycas* megasporophyll
16. *Pisum* plant (pea)
17. *Zea* (corn) plant

#### **Section – E**

18. *Nostoc* – Vegetative filament
19. *Spirogyra* Vegetative filament
20. *Rhizopus* – mycelium
21. *Agaricus* Basidiocarp

### **V. Record and Herbarium**

Herbarium: 10 Sheets should be prepared by the student out of which two will be Economic importance; two will be of Ecological importance and the remaining six will be of the families included in the syllabus.

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**VOCATIONAL BRIDGE COURSE**

**ZOOLOGY – First Year (w.e.f. 2016-2017)**

**WEIGHTAGE OF MARKS**

<b>S.No.</b>	<b>Topics</b>	<b>Number of Periods</b>	<b>Weightage of Marks</b>
1.	Diversity of Living World	05	02
2.	Structural Organisation in Animals	06	05
3.	Animal Diversity - I (Invertebrate Phyla)	06	05
4.	Animal Diversity - II (Chordata Phylum)	06	05
5.	Biology in Human Welfare	08	09
6.	Periplaneta americana (Cockroach)	08	05
7.	Ecology and Environment	09	09
<b>Total</b>		<b>48</b>	<b>40</b>

**TELANGANA STATE BOARD OF INTERMEDIATE EDUCATION, HYDERABAD**

**VOCATIONAL BRIDGE COURSE**

**ZOOLOGY – First Year (w.e.f. 2016-2017)**

**MODEL QUESTION PAPER**

**Time: 1 ½ Hours**

**Max.Marks: 25**

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**Section – A**

**5x1=5**

**Note:**

- i) *Answer any **five** of the following questions*
- ii) *Each question carries **one** mark.*

1. Define species richness.
2. List out any four sacred grooves in India.
3. Define osteon.
4. What is the function of Radula? Give the name of the group of molluscan which do not possess the radula.
5. What is the importance of air bladder in fishes?
6. What is a hyper parasite? Mention the name of one hyper parasite.
7. Name the different blood sinuses in Cockroach.
8. What are the Circadian rhythms?

**Section – B**

**5x4=20**

**Note:**

- i) *Answer any **five** of the following questions*
- ii) *Each question carries **four** marks.*
- iii) *Draw a neat labelled diagram wherever necessary.*

9. Describe the three types of cartilage.
10. What are chief characters of the crustaceans?
11. What are the modifications that are observed in birds that help them in flight?
12. Explain the life cycle of *Entamoeba histolytica*?
13. “Prevention is better than cure”? Justify with regard “TDA” abuse.
14. Draw a neat labeled diagram of Mouth parts of Cockroach?
15. What is summer stratification? Explain?
16. Discuss the causes and effects of global warming? What measures need to be taken to control of global warming?

**TELANGANA STATE BOARD OF INTERMEDIATE EDUCATION, HYDERABAD**

**VOCATIONAL BRIDGE COURSE**

**ZOOLOGY – First Year (w.e.f. 2016-2017)**

**QUESTION BANK**

**Chapter 1: DIVERSITY OF LIVING WORLD**

***Very Short Answer Questions (1 Mark)***

1. What is trinomial nomenclature? Give an example.
2. What is meant by tautonymy? Give two examples.
3. Differentiate between Protostomia and Deuterostomia.
4. What does ICZN stand for?
5. What is ecological diversity? Mention the different types of ecological diversities.
6. Define species richness.
7. Mention any two products of medicinal importance obtained from nature.
8. List out any four sacred groves in India.
9. Write the full form of IUCN. In which book threatened species are enlisted

**Chapter2: STRUCTURAL ORGANISATION IN ANIMALS**

***Very Short Answer Questions (1 Mark)***

10. What is cephalization? How is it useful to its possessors?
11. Mention any two substances secreted by mast cells and their functions.
12. Distinguish between a tendon and a ligament.
13. Distinguish between brown fat and white fat.
14. What is the strongest cartilage? In which regions of the human body, do you find it?
15. Define osteon.
16. What are Volkmann's canals? What is their role?
17. What is a Sesamoid bone? Give an example.
18. What is lymph? How does it differ from plasma?
19. What is the haematocrit value?
20. What are intercalated discs? What is their significance?

**Short Answer Questions (4 Marks)**

21. Give an account of glandular epithelium.
22. Describe the three types of cartilage.
23. Explain Haversian system.
24. Describe the structure of a skeletal muscle.
25. Describe the structure of a cardiac muscle.
26. Describe the structure of a multipolar neuron.

**Chapter 3: ANIMAL DIVERSITY – I (Invertebrate Phyla)**

**Very Short Answer Questions (1 Mark)**

27. What are the functions of canal system of sponges?
28. What are the two chief morphological 'bodyforms' of cnidarians? What are their chief functions?
29. What are the excretory cells of flatworms called? What is the other important function of these specialized cells?
30. What is botryoidal tissue?
31. Which arthropod, you have studied, is called a 'living fossil'? Name its respiratory organs?
32. What is the function of radula? Give the name of the group of mollusks which do not possess a radula?
33. What is the other name for the gill of a mollusc? What is the function of osphradium?
34. What is Aristotle's lantern? Give one example of an animal possessing it?
35. What are blood glands in *Pheretima*?
36. What are spermathecae on the body of *pheretima*?

**Short Answer Questions (4 Marks)**

37. Write short notes on the salient features of the anthozoans.
38. What is the class to which the flukes belong? Write short notes on the chief characters of that group?
39. What are the salient features exhibited by polychaetes?
40. What are the chief characters of the crustaceans?

41. Compare briefly a centipede and a millipede.
42. What are the salient features of the echinoids?

## **Chapter 4: ANIMAL DIVERSITY – II (Chordata Phylum)**

### ***Very Short Answer Questions (1 Mark)***

43. What is the importance of air bladder in fishes?
44. Distinguish between milt and spawn.
45. Name two poisonous and nonpoisonous snakes found in south India.
46. Name the four extra embryonic membranes.
47. What are Jacobson's organs? What is their function?
48. What are pneumatic bones? How do they help birds?
49. Name the three meninges. In which group of animals do you find all of them?
50. How do you distinguish a male frog from a female frog?

### ***Short Answer Questions (4 Marks)***

51. Name the four 'hallmarks' of chordates, and explain the principal function of each of them.
52. List out eight characteristics that help distinguish a fish from the other vertebrates.
53. Compare and contrast cartilaginous and bony fishes.
54. Write eight salient features of the class Amphibia.
55. What are the modifications that are observed in birds that help them in flight?
56. What are the features peculiar to ratite birds? Give two examples of ratite birds.

## **Chapter 5: BIOLOGY IN HUMAN WELFARE**

### ***Very Short Answer Questions (1 Mark)***

57. What is a hyper-parasite? Mention the name of one hyper-parasite.
58. What do you mean by parasitic castration? Give one example.
59. Define neoplasia. Give one example.
60. What are the stages of *Plasmodium vivax* that infect the RBC of the intermediate host?
61. Define prepatent period. What is its duration in the life cycle of *Plasmodium vivax*?
62. Define incubation period. What is its duration in the life cycle of *Plasmodium vivax*?



63. What are Schuffner's dots? What is their significance?
64. What are haemozoin granules? What is their significance?
65. Describe the methods of biological control of mosquitoes.
66. What is meant by nocturnal periodicity with reference to the life history of a nematode parasite you have studied?

**Short Answer Questions (4 Marks)**

67. What is the need for parasites to develop special adaptations? Mention some special adaptations developed by the parasites.
68. Describe the structure of a trophozoite of *Entamoeba histolytica*.
69. Explain the life cycle of *Entamoeba histolytica*.
70. Write a short note on the pathogenicity of *Entamoeba histolytica*.
71. Describe the cycle of Golgi in the life history of *Plasmodium vivax*.
72. Explain the pathogenicity of *Wuchereria bancrofti* in man.
73. Write short notes on typhoid fever and its prophylaxis.
74. Write short notes on pneumonia and its prophylaxis.
75. Write short notes on common cold and its prophylaxis.
76. Write short notes on 'ringworm' and its prophylaxis.
77. What are the adverse effects of tobacco?
78. Why in adolescence is considered vulnerable phase?
79. Distinguish between addiction and dependence.
80. 'Prevention is better than cure'. Justify with regard to TDA abuse.

**Chapter 6: PERIPLANETA AMERICANA**

**Very Short Answer Questions (1 Mark)**

81. Name the muscles that help in elevating and depressing the wings of a cockroach?
82. Name the different blood sinuses in cockroach?
83. Which part of the gut secretes the peritrophic membrane in cockroach?
84. What is haemocoel?
85. Why is the blood of *Periplaneta* called haemolymph?
86. Write important functions of blood in *Periplaneta*?

87. How many spiracles are present in cockroach? Mention their locations.
88. What are trichomes? Write their functions.
89. Why is the respiratory system of cockroach called polypneustic and holopneustic system?
90. What is intima?
91. What is 'storage excretion'?
92. Which of the abdominal ganglia is the largest and why?

***Short Answer Questions (4 Marks)***

93. Draw a neat labeled diagram of the mouthparts of cockroach?
94. Describe the physiology of digestion in cockroach?
95. Draw a neat labeled diagram of the salivary apparatus of cockroach?
96. How does *Periplaneta* conserve water? Explain it with the help of excretion in it?
97. Draw a neat and labeled diagram of ommatidium.

**Chapter 7: ECOLOGY AND ENVIRONMENT**

***Very Short Answer Questions (1 Mark)***

98. Define the term ecology and its branches.
99. What is an ecosystem?
100. Explain the difference between the 'niche' of an organism and its 'habitat'.
101. What are circadian rhythms?
102. Mention the advantages of some UV rays to us.
103. What is cyclomorphosis? Explain its importance in *Daphnia*.
104. Define commensalism. Give one example.
105. Define mutualism. Give one example.
106. Distinguish between neuston and nekton
107. What is periphyton?
108. Write three examples for man-made ecosystems.
109. Define entropy?
110. Which air pollutants are chiefly responsible for acid rains?
111. What is BOD?

112. What is biological magnification?
113. Why are incinerators used in hospitals?

***Short Answer Questions (4 Marks)***

114. What is summer stratification? Explain.
115. Explain van't Hoff rule.
116. How do terrestrial animals protect themselves from the danger of dehydration of bodies?
117. How do marine animals adapt to hypertonic seawater?
118. Discuss the various types of adaptations in freshwater animals.
119. Distinguish between euryhaline and stenohaline animals.
120. Write notes on the structure and functioning of an ecosystem.
121. Explain the different types of aquatic ecosystems.
122. Explain the different types of terrestrial ecosystems.
123. Write a note on DFC. Give its significance in a terrestrial ecosystem.
124. Define ecological pyramids and describe with examples, pyramids of numbers and biomass.
125. What are the deleterious effects of depletion of ozone in the stratosphere?
126. Describe 'Green House Effect'?
127. Discuss the causes and effects of global warming. What measures need to be taken to control 'Global Warming' ?

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**ZOOLOGY – Second Year (w.e.f. 2016-2017)**

**WEIGHTAGE OF MARKS**

<b>S.No.</b>	<b>Topics</b>	<b>Number of Periods</b>	<b>Weightage of Marks</b>
I.	<b>Human Anatomy and Physiology-I</b> <b>I A: Digestion and absorption</b> <b>I B: Breathing and Respiration</b>	08	06
II.	<b>Human Anatomy and Physiology-II</b> <b>II A: Body Fluids and Circulation</b> <b>II B: Excretory products and their elimination</b>	08	05
III.	<b>Human Anatomy and Physiology-III</b> <b>IIIA: Muscular and Skeletal system</b> <b>III B: Neural control and co-ordination</b>	06	04
IV.	<b>Human Anatomy and Physiology-IV</b> <b>IVA: Endocrine system and chemical co-ordination</b> <b>IVB: Immune system</b>	06	04
V.	<b>Human Reproduction</b> <b>VA: Human Reproductive System</b> <b>VB: Reproductive Health</b>	08	06
VI.	<b>Genetics</b>	06	05
VII.	<b>Organic Evolution</b>	04	02
VIII.	<b>Applied Biology</b>	04	08
<b>Total</b>		<b>50</b>	<b>40</b>

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**ZOOLOGY – Second Year (w.e.f. 2016-2017)**

**MODEL QUESTION PAPER**

**Time: 1 ½ Hours**

**Max.Marks: 25**

**Section – A**

**5x1=5**

**Note:**

i) *Answer any **five** of the following questions*

ii) *Each question carries **one** mark.*

1. Give the dental formula of Adult human beings.
2. Name the muscle that help in normal breathing movement.
3. Name the structural and functional units of Kidney?
4. What are the functions of Sertoli cells and leydig cell in man.
5. Draw a neat labeled diagram of human sperm.
6. What is Turners Syndrome.
7. Mention the names of any two connecting links that you have studied.
8. Define the biogenetic law giving an example?

**Section – B**

**5x4=20**

**Note:**

i) *Answer any **five** of the following questions*

ii) *Each question carries **four** marks.*

iii) *Draw a neat labelled diagram wherever necessary.*

9. What are the functions of liver.
10. Describe the events in a cardiac cycle briefly.
11. Draw a neat labelled diagram of the spinal cord T.S of man.
12. Give an account of the secretion of the pituitary gland
13. Briefly describe the common sexually transmitted diseases in human being.
14. How is sex determined in human beings.
15. Explain the role of animal husbandry in human welfare.
16. Explain the different types of cancers.

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**ZOOLOGY – Second Year (w.e.f. 2016-2017)**

**QUESTION BANK**

**Unit I: HUMAN ANATOMY AND PHYSIOLOGY-I**

**I A: Digestion and Absorption**

***Very Short Answer Questions (1 Mark)***

1. Give the dental formula of adult human beings.
2. What would happen if, *HCl* were not secreted in the stomach?
3. What is auto catalysis? Give two examples.
4. What is chyme?
5. Name the different types of salivary glands of man and their locations in the human body.
6. Name different types of papillae present on the tongue of man.
7. What is the hardest substance in the human body?
8. Distinguish between diarrhea and constipation.

***Short Answer Questions (4 Marks)***

9. Draw a neat labeled diagram of L.S. of a tooth?
10. Describe the process of digestion of proteins in the stomach.
11. What are the functions of liver.

**I B: Breathing and Respiration**

***Very Short Answer Questions (1 Mark)***

12. What are conchae?
13. What is meant by chloride shift?
14. Name the muscles that help in normal breathing movements.
15. Draw a diagram of oxyhaemoglobin dissociation curve.

***Short Answer Questions (4 Marks)***

16. Explain the process of inspiration and expiration under normal conditions.
17. What are the major transport mechanisms for CO<sub>2</sub>? Explain.
18. Describe disorders of respiratory system.

**Unit II: HUMAN ANATOMY AND PHYSIOLOGY-II**

**II A: BODY FLUIDS AND CIRCULATION**

***Very Short Answer Questions (1 Mark)***

19. Sino-atrial node is called the pacemaker of our heart. Why.
20. Name the valves that guard the left and right atrioventricular apertures in man.
21. Name the heart sounds.
22. Define cardiac cycle and cardiac output.
23. What is meant by double circulation?
24. Why the arteries are more elastic than the veins.

***Short Answer Questions (4 Marks)***

25. Draw a labeled diagram of the L.S of the heart of man.
26. Describe the events in a cardiac cycle, briefly.
27. Explain the mechanism of clotting of blood.
28. Distinguish between arteries and veins.

**II B: EXCRETORY PRODUCTS AND THEIR ELIMINATION**

***Very Short Answer Questions (1 Mark)***

29. Name the blood vessels that enter and exit the kidney.
30. Name the structural and functional units of kidney. What are the two main types of structural units in it.
31. Define glomerular filtration.
32. What is meant by the term osmoregulation?

***Short Answer Questions (4 Marks)***

33. Draw a labeled diagram of the V.S. of kidney.
34. Describe the internal structure of kidney of man.

**Unit III: HUMAN ANATOMY AND PHYSIOLOGY-III**

**IIIA: MUSCULAR AND SKELETAL SYSTEM**

***Short Answer Questions (4 Marks)***

35. List out the bones of the human cranium.
36. List the bones of human fore limb.
37. List the bones of the human leg.
38. Describe the structure of synovial joint with the help of a neat labeled diagram.

**III B: NEURAL CONTROL AND CO-ORDINATION**

***Short Answer Questions (4 Marks)***

39. Draw a labeled diagram of the T.S. of the spinal cord of man.
40. Give an account of the retina of the human eye.

**UNIT IV: HUMAN ANATOMY AND PHYSIOLOGY-IV**

***IVA: ENDOCRINE SYSTEM AND CHEMICAL CO-ORDINATION***

***Short Answer Questions (4 Marks)***

41. List out the names of endocrine glands present in human beings and mention the hormones they secrete.
42. Give an account of the secretions of pituitary gland.
43. Write a note on Addison's disease and Cushing's syndrome.



## **IVB: IMMUNE SYSTEM**

### ***Short Answer Questions (4 Marks)***

44. Describe various types of barriers of innate immunity.

## **Unit VA: HUMAN REPRODUCTION**

### ***VA: HUMAN REPRODUCTIVE SYSTEM***

#### ***Very Short Answer Questions (1 Mark)***

45. Where are the testes located in man?
46. Name the canals that connect the cavities of scrotal sac and abdominal cavity.
47. What are functions of Sertoli cells and Leydig cells in man?
48. Name the copulatory structure of man. What are the three columns of tissues in it?
49. Define gestation period.
50. Write two major functions, each of testis and ovary.
51. Draw a labeled diagram of a sperm.
52. What are the major components of the seminal fluid?
53. What are the four extra embryonic membranes?

#### ***Short Answer Questions (4 Marks)***

54. Describe microscopic structure of testis of man.
55. Describe microscopic structure of ovary of woman.
56. Draw labeled diagram of the male reproductive system.
57. Draw labeled diagram of the female reproductive system.

## **V B: REPRODUCTIVE HEALTH**

### ***Short Answer Questions (4 Marks)***

58. Briefly describe the common sexually transmitted diseases in human beings.
59. Is sex education necessary in schools? Why?

## **Unit VI: GENETICS**

#### ***Very Short Answer Questions (1 Mark)***

60. What is pleiotropy?
61. What are the antigens causing 'ABO' blood grouping? Where are they present?

62. What are the antibodies of 'ABO' blood grouping? Where are they present?
63. What are multiple alleles?
64. What is the genetic basis of blood types in ABO system in man?
65. What is Klinefelter's syndrome?
66. What is Turner's syndrome?
67. What is Down syndrome?
68. What is crisscross inheritance?
69. What are sex limited characters?
70. What are sex influenced characters?
71. List out any two applications of DNA fingerprinting technology.

***Short Answer Questions (4 Marks)***

72. How is sex determined in human beings?
73. Describe erythroblastosis foetalis.
74. Describe the genetic basis of ABO blood grouping.
75. Write the silent features of 'HGP'.
76. Describe the steps involved in DNA fingerprinting technology.

## **Unit VII: ORGANIC EVOLUTION**

***Very Short Answer Questions (1 Mark)***

77. What are panspermia?
78. Mention the names of any two connecting links that you have studied.
79. Define Biogenetic Law.
80. Define atavism with an example.
81. Cite two examples to disprove Lamarck's inheritance of acquired characters.
82. Who influenced Darwin most, in formulating the idea of Natural Selection?
83. What is common between Darwinism and Lamarckism?
84. What is meant by genetic load?
85. Mention the scientific names of ape like and man like earlier primates. Which man like primate first used hides to cover the bodies?

## **Unit VIII: APPLIED BIOLOGY**

### ***Short Answer Questions (4 Marks)***

86. Define the term 'breed'. What are the objectives of animal breeding?
87. Explain the role of animal husbandry in human welfare.
88. Explain the important components of poultry management.
89. Honey bees are economically important-justify.
90. Define vaccine and discuss about types of vaccines.
91. List out any four salient features of cancer cells.
92. Explain the different types of cancers.
93. Write briefly about different waves and intervals in ECG.

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**ZOOLOGY**

**PRACTICAL SYLLABUS (w.e.f. 2016-2017)**

- I. Identification of displayed chart** **1 + 2 + 2 = 5 Marks**
- (a) Human being - Digestive System
  - (b) Human being - Male Reproductive System
  - (c) Human being - Female Reproductive System
  - (d) Human - Eye
  - (e) Human - Ear
- II. Physiology** **1 + 3 + 1 = 5 Marks**
1. Identification of Sugar, Albumin and Starch in given sample.
- III. Spotting: Specimens + slides – Marks 1 + 1 = 2** **( $\frac{1}{2} + 1 + \frac{1}{2} = 2$ )**
1. Spong **2 x 5 = 10 Marks**
  2. Jelly fish
  3. Tape worm
  4. Ascais – Male & Female
  5. Earth worm
  6. Leech
  7. Scorpion, palaemon, crab, spider, butterfly
  8. Pila
  9. Star fish
  10. T.S. of Liver, T.S. of starch, T.S. of Intestine, T.S. of Pancreas, T.S. ovary.
    - (a) Simple Squamous epithelium (b) Columnar epithelium
    - (c) T.S of blood smear (d) T.S. of bone.
  11. Osteology:- Joints :- Pivot Joint, Ball & socket joint, Hinge joint, glinding joint.
  12. Record - **5 Marks**

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**ZOOLOGY**

**PRACTICAL MODEL QUESTION PAPER (w.e.f. 2016-2017)**

**Time: 2 Hours**

**Max.Marks: 25**

**Q:I Identification of displayed Chart /Model.**

**Draw a neat labelled diagram of the same? (5) 1 + 2 + 2 = 5 Marks**

- |                                       |   |   |       |
|---------------------------------------|---|---|-------|
| (1) Identification of Chart/Model (1) | 1 | - | Mark  |
| (2) Drawing the Chart/Model (2)       | 2 | - | Marks |
| (3) Labeling minimum (4)              | 2 | - | Marks |

**Q:II Identify the presence of sugar in the given A, B, C, D samples. Write the principle procedure and the inference. (5) 1 + 3 + 1 = 5 Marks**

- |               |          |          |
|---------------|----------|----------|
| (1) Principle | -        | 1        |
| (2) Procedure | -        | 3        |
| (3) Result    | -        | 1        |
| <b>Total</b>  | <b>-</b> | <b>5</b> |

**Q:III Identify the given a, b, c, d, e spottes. Draw, lable and write the characters.**

**2 x 5 = 10 Marks**

- |                     |          |          |
|---------------------|----------|----------|
| (1) Identification  | -        | ½ Mark   |
| (2) Diagram + Lable | -        | ½ “      |
| (3) Characters (5)  | -        | 1        |
| <b>Total</b>        | <b>-</b> | <b>2</b> |

**Q:IV Record Book.**

**5 Marks**

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**VOCATIONAL BRIDGE COURSE**

**Physics – I Years (w.e.f 2016-17)**

**Paper - I**

**Weightage of Marks**

<b>S.No. Chapter No.</b>	<b>Chapters</b>	<b>Number of Periods</b>	<b>Weight age</b>
1.	Physical World	01	01
2.	Units & Measurements	05	01
3.	Motion in Straight Line	05	01
4.	Motion in a Plane	07	04
5.	Laws of Motion	05	04
6.	Work, Energy and Power	08	04
7.	System of Particles and Rotational Motion	09	04
8.	Oscillations	05	04
9.	Gravitation	05	04
10.	Mechanical Properties of Solids	03	01
11.	Mechanical Properties of Fluids	05	01+01+02
12.	Thermal Properties of Matter	06	04+01=05
13.	Thermodynamics	04	04
14.	Kinetic Theory	01	01
<b>Total</b>		<b>69</b>	<b>40</b>

**TELANGANA STATE BOARD OF INTERMEDIATE EDUCATION, HYDERABAD**

**VOCATIONAL BRIDGE COURSE**

**MODEL QUESTION PAPER**

**Time: 1 ½ Hours**

**Physics – I Year (w.e.f 2016-17)**

**Max.Marks: 25**

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**Section – A**

**5x1=5**

**Instructions:**

- i) *Answer any **five** of the following questions*
  - ii) *Each question carries **one** mark.*
1. What is the discovery of C.V. Raman?
  2. Distinguish between fundamental units and derived units.
  3. Can the velocity of an object be in direction other than the direction of acceleration of the object?
  4. State Hooke's law of elasticity?
  5. Define pressure.
  6. What is angle of contact?
  7. Why are gaps left between rails in a railway track?
  8. State Boyle's law.

**Section – B**

**5x4=20**

**Instructions:**

- i) *Answer any **five** of the following questions*
  - ii) *Each question carries **four** marks.*
9. Show that the trajectory of an object thrown at certain angle with the horizontal is a parabola.
  10. Calculate the time needed for a net force of 5N to change the velocity of a 10KG mass by 2m/sec.
  11. Prove the law of conservation of energy in the case of a freely falling body.
  12. Define vector product. Explain the properties of vector product.
  13. A girl is swinging seated in a swing. What is the effect on the frequency of oscillation if she stands? Explain.
  14. What is orbital velocity? Obtain an expression for it.
  15. In what way is the anomalous behavior of water is advantageous to aquatic animals.
  16. Explain qualitatively the working of a heat engine.

**TELANGANA STATE BOARD OF INTERMEDIATE EDUCATION, HYDERABAD**

**VOCATIONAL BRIDGE COURSE**

**Physics – I Year (w.e.f 2016-17)**

**QUESTION BANK**

**Chapter 1: PHYSICAL WORLD**

*Very Short Answer Questions*

1. What is Physics?
2. What is the discovery of C.V. Raman?
3. What are the fundamental forces in matter?
4. What is the contribution of Chandra Sekhar to Physics?

**Chapter 2: UNITS & MEASUREMENTS**

*Very Short Answer Questions*

5. Distinguish between accuracy and precision.
6. What are the different types of errors that can occur in a measurement?
7. How can systematic errors be minimized or eliminated?
8. Distinguish between fundamental units and derived units.
9. Why do we have different units for the same physical quantity?
10. Express unified atomic mass unit in kg.

**Chapter 3: MOTION IN STRAIGHT LINE**

*Very Short Answer Questions*

11. How is average velocity different from instantaneous velocity?
12. Give an example where the velocity an object is zero but its acceleration is not zero.
13. A vehicle travels half the distance L with speed  $v_1$  and the other half with speed  $v_2$ .  
What is the average speed?
14. Can the velocity of an object be in a direction other than the direction of acceleration of the object?
15. A ball is dropped from the roof of a tall building and simultaneously an-other ball is thrown horizontally with some velocity from the same roof. Which ball lands first?



## Chapter 4: MOTION IN A PLANE

### Very Short Answer Questions

16. The vertical component of a vector is equal to its horizontal component. What is the angle made by the vector with x-axis?
17. What is the acceleration of a projectile at the top of its trajectory?

### Short Answer Questions

18. Two forces of magnitudes 3 units and 5 units act at  $60^\circ$  with each other. What is the magnitude of their resultant?
19.  $A = \vec{i} + \vec{j}$ . What is the angle between the vector and x-axis?
20. When two right angled vectors of magnitude 7 units and 24 units combine, what is the magnitude of their resultant?
21. If  $P = 2\vec{i} + 4\vec{j} + 14\vec{k}$  and  $Q = 4\vec{i} + 4\vec{j} + 10\vec{k}$  find the magnitude of  $P + Q$ .
22. State Parallelogram law of Vectors. Derive an expression for the magnitude.
23. Define unit vector, null vector and position vector.
24. If  $|\vec{a} + \vec{b}| = |\vec{a} - \vec{b}|$  prove that the angle between  $\vec{a}$  and  $\vec{b}$  is  $90^\circ$ .
25. Show that the trajectory of an object thrown at certain angle with the horizontal is a parabola.

## Chapter 5: LAWS OF MOTION

### Very Short Answer Questions

26. What is inertia?
27. When a bullet is fired from a gun, the gun gives a kick in the backward direction. Explain.
28. Why does a heavy rifle not recoil as strongly as a light rifle using the same cartridges?
29. If a bomb at rest explodes into two pieces, the pieces must travel in opposite direction. Explain.
30. Define force.
31. Why does the car with a flattened tyre stop sooner than the one with inflated tyres?

### ***Short Answer Questions***

32. Define the terms momentum and impulse. State and explain the law of conservation of linear momentum.
33. Explain the terms limiting friction, dynamic friction and rolling friction.
34. Explain advantages and disadvantages of friction.
35. Mention the methods used to decrease friction.
36. Derive the equation of motion  $F = ma$ .

## **Chapter 6: WORK, ENERGY AND POWER**

### ***Very Short Answer Questions***

37. State the conditions under which a force does not work.
38. State the relation between the kinetic energy and momentum of a body.

### ***Short Answer Questions***

39. Define: Work, Power and Energy. State their SI units.
40. What is potential energy? Derive an expression for the gravitational potential energy.
41. State and explain the law of conservation of energy?
42. Develop the notions of work and kinetic energy and show that it leads to work-energy theorem.
43. What are collisions? Explain the possible types of collisions?
44. State and prove law of conservation of energy in case of a freely falling body.

## **Chapter 7: SYSTEM OF PARTICULARS AND RETINAL MOTION**

### ***Very Short Answer Questions***

45. Is it necessary that a mass should be present at the centre of mass of any system?
46. Why are spokes provided in a bicycle wheel?
47. Why do we prefer a spanner of longer arm as compared to the spanner of shorter arm?
48. By spinning eggs on a table top, how will you distinguish a hard boiled egg from a raw egg?

### ***Short Answer Questions***

49. Distinguish between centre of mass and centre of gravity.
50. Define vector product. Explain the properties of a vector product.
51. Define angular velocity ( $\omega$ ). Derive  $v = r\omega$ .
52. Define angular acceleration and torque. Establish the relation between angular acceleration and torque.

## **Chapter 8: OSCILLATIONS**

### ***Short Answer Questions***

53. A girl is swinging seated in a swing. What is the effect on the frequency of oscillation if she stands? Explain.
54. The bob of a simple pendulum is a hollow sphere filled with water. How will the period of oscillation change, if the water begins to drain out of the hollow sphere?
55. The bob of a simple pendulum is made of wood. What will be the effect on the time period if the wooden bob is replaced by an identical bob of aluminum?
56. A pendulum clock gives correct time at the equator. Will it gain or lose time if it is taken to the poles? If so, why?
57. Define simple harmonic motion? Give two examples.
58. Show that the motion of a simple pendulum is simple harmonic and hence derive an equation for its time period.
59. What is seconds pendulum? Calculate its length on the earth ( $g = 9.8 \text{ m/s}^2$ )

## **Chapter 9: GRAVITATION**

### ***Very Short Answer Questions***

60. State the unit of the universal gravitational constant (G).
61. What is the time period of revolution of geostationary satellite?
62. What are polar satellites?

### ***Short Answer Questions***

63. State Kepler's law of planetary motion.
64. Derive the relation between acceleration due to gravity( $g$ ) at the surface of a planet and Gravitational constant ( $G$ ).
65. What is orbital velocity? Obtain an expression for it.
66. What is escape velocity? Obtain an expression for it.
67. What is geostationary satellite? State its uses.

## **Chapter 10: MECHANICAL PROPERTIES OF SOLIDS**

### ***Very Short Answer Questions***

68. State Hooker's law of elasticity.
69. State the units of stress.
70. State the units of modulus of elasticity.
71. State the examples of nearly perfect elastic bodies.
72. State the examples of nearly plastic bodies.
73. State the units of Young's modulus.

### ***Short Answer Questions***

74. Describe the behaviour of a wire under gradually increasing load.

## **Chapter 11: MECHANICAL PROPERTIES OF FLUIDS**

### ***Very Short Answer Questions***

75. Define coefficient Viscosity.
76. What is the principle behind the carburetor of an automobile?
77. What is magnus effect.
78. What are drops and bubbles spherical?
79. Give the expression for the excess pressure in liquid drop.
80. Give the expression for the excess pressure in an air bubble inside the liquid.
81. Give the expression for the soap bubble in air.
82. What are water proofing agents.
83. What are water wetting agents?
84. What is angle of contact?

85. Mention any one example that obey Bernoulli's theorem.
86. When water flows through a pipe, which of the layers moves fastest and slowest.

## **Chapter 12: THERMAL PROPERTIES OF MATTER**

### ***Very Short Answer Questions***

87. Distinguish between heat and temperature.
88. What are the lower and upper fixing points in Fahrenheit scales?
89. Do the values of coefficients of expansion differ, when the temperatures are measured on Centigrade scale or on Fahrenheit scale.
90. Can a substance contract on heating? Give an example.
91. Why gaps are left between rails on a railway track?
92. Why do liquids have no linear and areal expansion?
93. What is latent heat of fusion?
94. Why utensils are coated black?
95. Why the bottom of the utensils are made of copper?
96. State Weins displacement law?
97. Ventilators are provided in rooms just below the roof. Why?
98. Does a body radiate heat at 9 K?
99. Does a body radiate heat at 0°C?
100. State the different modes of transmission of heat.
101. Define coefficient of thermal conductivity.
102. What is greenhouse effect.
103. Explain global warming.
104. State the conditions under which Newton's law of cooling is applicable.
105. The roof of buildings are often painted white during summer. Why?

### ***Short Answer Questions***

106. Explain Celsius and Fahrenheit scales of temperature. Obtain the relation between Celsius and Fahrenheit scales of temperature.
107. Two identical rectangular strips, one of copper and the other of steel, are riveted together to form a compound bar. What will happen on heating?

108. Pendulum clocks generally go fast in winter and slow in summer. Why?
109. In what way is the anomalous behaviour of water advantageous of aquatic animals?
110. Explain conduction, convection and radiation with examples.

## **Chapter 13: THERMODYNAMICS**

### ***Very Short Answer Questions***

111. Define Thermal equilibrium. How does it lead to Zeroth Law of Thermodynamics?
112. What thermodynamic variables can be defined by Zeroth Law
113. Define molar specific heat capacity.
114. Why a heat engine with 100% efficiency can never be realized in practice?

### ***Short Answer Questions***

115. Explain the following process i) Isochoric process ii) Isobaric process
116. State and explain first law of thermodynamics
117. Define two principle specific heats of a gas. What is greater and Why?
118. Compare isothermal and adiabatic process.
119. Explain qualitatively the working of a heat engine.
120. How is heat engine different from a refrigerator.

## **Chapter 14: KINETIC THEORY**

121. Define mean free path.
122. When does a real gas behave like an ideal gas?
123. State Boyle's Law.
124. State Charles Law.
125. State Dalton's law of partial pressure.

**TELANGANA STATE BOARD OF INTERMEDIATE EDUCATION, HYDERABAD**

**VOCATIONAL BRIDGE COURSE**

**Physics Second Year**

**Paper – II (w.e.f 2016-17)**

**Weightage of Marks**

<b>S.No. Chapter No.</b>	<b>Chapters</b>	<b>Number of Periods</b>	<b>Weight age</b>
1.	Waves	05	04
2.	Ray Optics & Optical Instruments	05	04
3.	Wave Optics	05	01
4.	Electric Charges & Fields	04	01
5.	Electrostatic Potential & Capacitance	06	04
6.	Current Electricity	06	04
7.	Moving Charges & Magnetism	06	04
8.	Magnetism and Matter	03	01
9.	Electromagnetic Induction	04	01
10.	Alternating Current	03	01
11.	Electromagnetic Waves	02	01
12.	Dual Nature of Radiation & Matter	04	01
13.	Atoms	02	01
14.	Nuclei	06	04
15.	Semiconductor Electronics: Materials, Devices and Simple Circuits	06	04
16.	Communication Systems	02	01
<b>Total</b>		<b>69</b>	<b>40</b>

**TELANGANA STATE BOARD OF INTERMEDIATE EDUCATION, HYDERABAD**

**VOCATIONAL BRIDGE COURSE**

**MODEL QUESTION PAPER (w.e.f 2016-17)**

**Time: 1 ½ Hours**

**Paper – II (Physics)**

**Max.Marks: 25**

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**Section – A**

**5x1=5**

**Instructions:**

- i) Answer any **five** of the following questions
  - ii) Each question carries **one** mark.
1. Explain Brewster's Law
  2. What happens to the force between two charges if the distance between them is halved?
  3. What happens to the compass needles at the Earth's poles?
  4. What are Eddy currents?
  5. Define power factor?
  6. Give any one use of infra red rays.
  7. What is the physical meaning of 'negative energy of an electron'?
  8. Which type of communication is employed in mobile phones?

**Section – B**

**5x4=20**

**Instructions:**

- i) Answer any **five** of the following questions
  - ii) Each question carries **four** marks.
9. Distinguish between longitudinal waves and transverse waves.
  10. Draw a neat labeled diagram of a compound microscope and explain its working.
  11. Three capacitors of capacitances  $1\mu\text{F}$ ,  $2\mu\text{F}$ ,  $3\mu\text{F}$  are connected in parallel.
    - i) What is the ratio of charges.
    - ii) What is the ratio of potential differences.
  12. State and explain Kirchoff's laws for an electrical network.
  13. State and explain Bio-Savart law.
  14. Write Einstein's photo electric equation and explain it.
  15. Explain the working of a nuclear reactor with the help of a labeled diagram.
  16. How is a battery connected to junction diode i) forward bias and ii) reverse bias?



**TELANGANA STATE BOARD OF INTERMEDIATE EDUCATION, HYDERABAD**

**VOCATIONAL BRIDGE COURSE**

**Paper – II (Physics) (w.e.f 2016-17)**

**QUESTION BANK**

**Chapter 1: WAVES**

***Very Short Answer Questions***

1. What is transverse wave?
2. What is longitudinal wave?
3. What is meant by wavelength of a wave?
4. Write the equation of a periodic travelling wave?
5. What are stationary waves?
6. What are nodes and antinodes?
7. What is the phenomenon of Beats?
8. Write the equation for beat frequency?
9. What is Doppler effect?
10. What is the distance between a node and its adjacent antinode in a transverse wave?

***Short Answer Questions***

11. Distinguish between longitudinal and transverse waves and give examples.
12. Explain the nodes of vibration of a stretched string with examples.
13. Explain the formation of standing waves in a closed pipe.
14. Explain how beats are formed and mention their applications in everyday life.
15. Explain Doppler effect with an example. Write the equation for observed frequency when the source is moving 1) towards and 2) away from a stationary observer.

## **Chapter 2: RAY OPTICS AND OPTICAL INSTRUMENTS**

### ***Very Short Answer Questions***

16. Define critical angle.
17. What is total internal reflection?
18. Define power of a lens.
19. What is the S.I unit of power of lens?
20. Define principle focus of a lens.
21. What is myopia?
22. What is hypermetropia?
23. What is dispersion?

### ***Short Answer Questions***

24. State the laws of refraction.
25. An object is placed 10cm in front of a concave mirror of radius of curvature 15cm. Find the position, nature and magnification of the image.
26. Define critical angle. Explain total internal reflection using a neat diagram.
27. What is an optical fibre? What are its uses?
28. What is total internal reflection? Give any two examples.
29. What is a simple microscope? Explain the formation of the image in a simple microscope with a neat labeled diagram.
30. Draw a neat labeled diagram of compound microscope and explain its working.

## **Chapter 3: WAVE OPTICS**

### ***Very Short Answer Questions***

31. What is interference of light.
32. What is diffraction?
33. What is polarization of light?
34. What is Malu's law?
35. What is Brewster's law?

### ***Short Answer Questions***

36. Describe Young's double slit experiment for observing interference.
37. Does principle of conservation of energy hold for interference and diffraction phenomena? Explain briefly.

## **Chapter 4: ELECTRIC CHARGES AND FIELDS**

### ***Very Short Answer Questions***

38. What is meant by the statement 'charge is quantized'?
39. How many electrons constitute 1 C of charge?
40. What happens to the force between two charges if the distance between them is halved?
41. The electric lines of force do not intersect. Why?
42. State Gauss's law in electrostatics.
43. Write the expression for electric intensity due to an infinite plane sheet of charge.

### ***Short Answer Questions***

44. State and explain Coulomb's inverse square law in electricity.
45. Derive the equation for the couple acting on a electric dipole in a uniform electric field.
46. State Gauss's law in electrostatics and explain its importance.

## **Chapter 5: ELECTRIC POTENTIAL AND CAPACITANCE**

### ***Very Short Answer Questions***

47. Can there be electric potential at a point with zero electric intensity?
48. Can there be electric intensity at a point with zero electric potential?
49. What are meant by equipotential surfaces?

### ***Short Answer Questions***

50. Three capacitors of capacitances  $1\ \mu\text{F}$ ,  $2\ \mu\text{F}$ , and  $3\ \mu\text{F}$  are connected in parallel.
  - (a) What is the ratio of charges?
  - (b) What is the ratio of potential differences?

51. Three capacitors of capacitances  $1\ \mu\text{F}$ ,  $2\ \mu\text{F}$ , and  $3\ \mu\text{F}$  are connected in series
  - (a) What is the ratio of charges?
  - (b) What is the ratio of potential differences?
52. Derive an expression for the capacitance of a parallel plate capacitor.
53. Derive the formula for equivalent capacitance of capacitors connected in series.
54. Derive the equation for equivalent capacitance of capacitors connected in parallel.

## Chapter 6: CURRENT ELECTRICITY

### *Very Short Answer Questions*

55. State Ohm's law.
56. Define resistivity.
57. Why is manganin used for making standard resistors?
58. Why are household appliances connected in parallel?

### *Short Answer Questions*

59. A battery of emf  $10\text{V}$  and internal resistance  $3\Omega$  is connected to a resistor  $R$ .
  - (i) If the current in the circuit is  $0.5\text{A}$ . Calculate the value of  $R$ .
  - (ii) What is the terminal voltage of the battery when the circuit is closed
60. State and explain Kirchhoff's law for an electrical network.
61. Using Kirchhoff's laws deduce the condition for balance in a Wheatstone bridge.
62. State the working principle of potentiometer.
63. Explain with the help of circuit diagram how the emf of two primary cells are compared by using the potentiometer
64. State the working principle of potentiometer.
65. Explain with the help of circuit diagram how the potentiometer is used to determine the internal resistance of the given primary cell.
66. A  $10\Omega$  thick wire is stretched so that its length becomes three times. Assuming that there is no change in its density on stretching, calculate the resistance of the stretched wire.

## **Chapter 7: MOVING CHARGES AND MAGNETISM**

### ***Very Short Answer Questions***

67. State Ampere's law.
68. State Biot-Savart law.
69. A circular coil of radius 'r' having N turns carries a current "i". What is its magnetic moment?
70. How do you convert a removing coil galvanometer into an ammeter?
71. How do you convert a removing coil galvanometer into a voltmeter?

### ***Short Answer Questions***

72. State and explain Biot-Savart law.
73. State and explain Ampere's law.
74. Derive an expression for the magnetic field at a point on the axis of a current carrying circular coil using Biot-Savart law.

## **Chapter 8: MAGNETISM AND MATTER**

### ***Very Short Answer Questions***

75. What happens to compass needles at the Earth's poles?
76. What do you understand by the 'magnetization' of a sample?
77. What are the units of magnetic moment, magnetic induction or magnetic field?
78. Magnetic lines form continuous closed loops. Why?
79. Classify the following materials with regard to magnetism: Manganese, Cobalt, Nickel, Bismuth, Oxygen, Copper

### ***Short Answer Questions***

80. Compare the properties of para, dia and ferromagnetic substances.

## **Chapter 9: ELECTROMAGNETIC INDUCTION**

### ***Very Short Answer Questions***

81. Define magnetic flux.
82. State Faraday's law of electromagnetic induction.
83. State Lenz's law.
84. What happens to the mechanical energy (of motion) when a conductor is moved in a uniform magnetic field.
85. What are Eddy currents?
86. Define self inductance.

### ***Short Answer Questions***

87. Describe the ways in which Eddy currents are used to advantage.

## **Chapter 10: ALTERNATING CURRENT**

### ***Very Short Answer Questions***

88. A transformer converts 200 V ac into 2000 V ac. Calculate the number of turns in the secondary if the primary has 10 turns.
89. What type of transformer is used in a 6V bed lamp?
90. What is the phenomenon involved in the working of a transformer?
91. What is transformer ratio?
92. Write the expression for the reactance of i) an inductor and ii) a capacitor.
93. Define power factor.

### ***Short Answer Questions***

94. State the principle on which a transformer works. Describe the working of a transformer with necessary theory.

## **Chapter 11: ELECTROMAGNETIC WAVE3S**

### ***Very Short Answer Questions***

95. What is the approximate wavelength of X- rays?
96. Give one use of infrared rays

97. If the wavelength of electromagnetic radiation is doubled , what happens to the energy of photon?
98. What is the principle of production of electromagnetic waves?
99. What is the ratio of speed of infrared rays and ultraviolet rays in vacuum?
100. Write one of the applications of microwaves?
101. Microwaves are used Radars, why?

## **Chapter 12: DUAL NATURE OF RADIATION AND MATTER**

### ***Very Short Answer Questions***

102. What is “work function”?
103. What is “photoelectric effect”?
104. Write down Einstein’s photoelectric equation.
105. Write down deBroglie’s relation and explain the terms therein.
106. State Heisenberg’s Uncertainty Principle.

### ***Short Answer Questions***

107. What is the effect of (i) intensity of light (ii) potential on photoelectric current?
108. Write and explain Einstein’s photoelectric equation.
109. What is the deBroglie wavelength of a ball of mass 0.12 Kg moving with a speed of  $20 \text{ ms}^{-1}$ ?

## **Chapter 13: ATOMS**

### ***Very Short Answer Questions***

110. What is the physical meaning of ‘negative energy of an electron’.
111. What is the difference between  $\alpha$ -particle and helium atom?
112. Among alpha, beta and gamma radiations, which get affected by the electric field?
113. Give two drawbacks of Rutherford’s atomic model.

### ***Short Answer Questions***

114. Drive an expression for potential and kinetic energy of an electron in any orbit of a hydrogen atom according to Bohr’s atomic model.

115. What are limitations of Bohr's theory of hydrogen atom?
116. Explain the different types of spectral series in Hydrogen atom.
117. State the basic postulates of Bohr's theory of atomic spectra.

## **Chapter 14: NUCLEI**

### ***Very Short Answer Questions***

118. What is a.m.u?
119. A nucleus contains no electrons but can emit them. How?
120. Neutrons are the best projectiles to produce nuclear reactions. Why?
121. Neutrons cannot produce ionization. Why?
122. What is the role of controlling rods in a nuclear reactor?
123. Why are nuclear fusion reactions called thermo nuclear reactions?
124. What is the function of moderator in a nuclear reactor?

### ***Short Answer Questions***

125. Write a short note on the discovery of neutron.
126. What are the properties of a neutron?
127. Deduce the relation between half life and average life of a radioactive substance.
128. What is nuclear fission? Give an example to illustrate it.
129. What is nuclear fusion? Write the conditions for nuclear fusion to occur.
130. Distinguish between nuclear fission and nuclear fusion.
131. Define mass defect and binding energy. How does binding energy per nucleon vary with mass number?
132. Explain the working of a nuclear reactor with the help of a labeled diagram.

## **Chapter 15: SEMICONDUCTOR ELECTRONICS: MATERIALS, DEVICES AND SIMPLE CIRCUITS**

### ***Very Short Answer Questions***

133. What are intrinsic semiconductors?
134. How is a battery connected to a junction diode in i) forward bias and ii) reverse bias?



135. What happens to the width of the depletion layer in a p-n junction diode when it is  
i)forwarded and ii)reverse bias?
136. Which gates are called universal gates?

***Short Answer Questions***

137. Draw and explain the current-voltage (I-V) characteristic curves of a junction diode in forward and reverse bias.
138. Describe how a semi conductor diode is used as a half wave rectifier.
139. What is rectification? Explain the working of a full wave rectifier.
140. Distinguish between half-wave and full-wave rectifiers.
141. Distinguish between zener breakdown and avalanche breakdown.
142. Draw NAND and NOR gates. Give their truth tables.
143. Explain the operation of a NOT gate and give its truth table.

**Chapter 16: COMMUNICATION SYSTEM**

***Very Short Answer Questions***

144. What are the basic blocks of communication system?
145. What is “World Wide WEB” (WWW)?
146. Define modulation. Why is it necessary?
147. Mention the basic methods of modulation.
148. Which type of communication is employed in Mobile Phones?

**TELANGANA STATE BOARD OF INTERMEDIATE EDUCATION, HYDERABAD**

**VOCATIONAL BRIDGE COURSE**

**PHYSICS I Year**

**PRACTICALS (w.e.f 2016-17)**

**(1) Vernier Calipers:**

Find the volume of a given brass/steel sphere using vernier calipers.

**(2) Screw Gauge:**

Find the thickness of a given glass plate using screw gauge.

**(3) Simple Pendulum:**

Find the acceleration due to gravity at your place using simple pendulum.

**(4) Concurrent forces:**

Verify the parallelogram law of forces and find the weight of a given stone in air using the parallelogram law (Take 2 observations in each case)

**(5) Force constant of a spring:**

Find the force constant of a given helical spring by the method of oscillation using different suspension weights. (Take 3 observations in each case)

**(6) Apparent expansion of liquid:**

Determine the coefficient of apparent expansion of a given liquid using specific gravity bottle. (Mass need not be calculated to correct upto milligram)

**(7) Boyle's Law:**

Plot  $h - \frac{1}{l}$  graph using Boyle's law apparatus (or) quill tube apparatus. Find the atmospheric pressure from the graph.

**(8) Specific Heat of a Solid:**

Find the specific heat of the given solid by using principle of method of mixtures. (Mass need not be calculated to correct upto milligram).

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**VOCATIONAL BRIDGE COURSE**

**PHYSICS II Year**

**PRACTICALS (w.e.f 2016-17)**

**(1) Velocity of Sound**

Determine the velocity of sound in air at room temperature using resonance apparatus.  
(Use two tuning forks of different frequencies)

**(2) Determination of Focal Length of a Concave Mirror**

Determination the focal length of a given concave mirror by u-v method.

**(3) Determination of Focal Length of a Convex Lens**

Determine the focal length of a given convex lens by u-v method.

**(4) Mapping of Magnetic field lines – Locating verbal points**

Draw the magnetic field lines in the combined magnetic field due to the earth and the bar magnet placed in the magnetic meridian with its North pole pointing towards geographical North. Locate Null points and calculate the Magnetic Moment of the given magnet. (Horizontal component of earth's Magnetic field =  $0.38 \times 10^{-4}$  Tesla)

**(5) Ohm's Law - Verification**

Verify Ohm's Law using R-Cot  $\theta$  graph method. (Take 6 observations)

**(6) Meter Bridge – Determination of Specific Resistance**

Find the specific resistance of a given wire using meter Bridge.

**(7) Junction Diode - Characteristics**

Draw Current – Voltage (I-V) characteristics of a junction diode (Take at least 6 observations)

**(8) Transistor Characteristics**

Draw characteristics of common emitter n-p-n (or p-n-p) transistor configuration and find the input resistance and output resistance from them).

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**VOCATIONAL BRIDGE COURSE**

**CHEMISTRY – First Year (w.e.f. 2016-2017)**

**WEIGHTAGE OF MARKS**

<b>S.No. Chapter No.</b>	<b>Chapters</b>	<b>Number of Periods</b>	<b>Weight age</b>
1.	Atomic Structure	10	04
2.	Classification of Elements and Periodicity of Properties	10	04
3.	Chemical Bonding and Molecular Structure	10	04
4.	States of Matter: Gases and Liquids	08	04
5.	Stoichiometry	07	02
6.	Thermodynamics	05	02
7.	Chemical Equilibrium and Acids-Bases	08	04
8.	Hydrogen and its Compounds	04	02
9.	The s– block Elements: (Alkali And Alkaline Earth Metals)	04	04
10.	P- Block Elements: Group-13 (Boron family)	04	02
11.	P - Block Elements: Group-14 (Carbon Family)	04	02
12.	Environmental Chemistry	04	02
13.	Organic Chemistry- Some Basic Principles and Techniques- Hydrocarbons	12	04
<b>Total</b>		<b>90</b>	<b>40</b>

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**VOCATIONAL BRIDGE COURSE**

**CHEMISTRY – First Year (w.e.f. 2016-2017)**

**MODEL QUESTION PAPER**

**Time: 1 ½ Hours**

**Max.Marks: 25**

**Section – A**

**5x1=5**

**Note:**

i) Answer any **five** of the following questions

ii) Each question carries **one** mark.

1. Assign oxidation number of Mn in  $\text{KMnO}_4$ .
2. Why is Hydrogen used in welding as high melting metals.
3. Name any two man made silicates.
4. What is green house effect.
5. Define normality.
6. Write any two uses of  $\text{H}_2\text{O}_2$ .
7. What is producer gas?
8. Write two harmful effects caused by ozone layer depletion.

**Section – B**

**5x4=20**

**Note:**

i) Answer any **five** of the following questions

ii) Each question carries **four** marks.

9. What are the postulates of Bohr's model of hydrogen atom.
10. Write an essay on s, p, d, and f block elements.
11. Write the shapes of the following molecules.  
i)  $\text{XeF}_2$     ii)  $\text{BrF}_5$     iii)  $\text{ClF}_3$     iv)  $\text{SF}_4$
12. Write the postulates of the Kinetic molecular theory.
13. (i) What are intensive and extensive properties (ii) Explain Inert Pair effect.
14. Define Lewis acids and Lewis bases. Give examples.
15. Give an account of the biological importance of  $\text{Na}^+$  and  $\text{Mg}^{+2}$  ions.
16. Describe two preparation methods of Ethane.

**TELANGANA STATE BOARD OF INTERMEDIATE EDUCATION, HYDERABAD**

**VOCATIONAL BRIDGE COURSE**

**CHEMISTRY – First Year (w.e.f. 2016-2017)**

**QUESTION BANK**

**Chapter 1: ATOMIC STRUCTURE**

***Short Answer Questions (4 Marks)***

1. What are the postulates of Bohr's model of hydrogen atom?
2. Explain various series of line spectra in hydrogen atom?
3. What are the evidences in favour of dual behavior of electron?
4. Explain the significance of  $n$ ,  $l$ ,  $m_l$  and  $m_s$  quantum numbers?
5. Define atomic orbitals, write the shapes of s, p, and d orbitals?
6. Define Aufbau Principle, Pauli's exclusion Principle and Hund's rule of maximum multiplicity?

**Chapter 2: CLASSIFICATION OF ELEMENTS AND PERIODICITY OF PROPERTIES**

***Short Answer Questions (4 Marks)***

7. State modern periodic law? How many groups and periods are present in the long form of the periodic table?
8. Write an essay on s, p, d and f block elements?
9. What is periodic property? How the following properties vary in a group and in a period, explain?  
a) Atomic radius b) Electron gain enthalpy?
10. What is periodic property? How the following properties vary in a group and in a period?  
a) Ionisation Enthalpy b) Electro negativity.
11. Why secondary Ionisation Enthalpy is greater than primary Ionisation enthalpy, explain it?

### Chapter 3: CHEMICAL BONDING AND MOLECULAR STRUCTURE

#### Short Answer Questions (4 Marks)

12. Explain the formation of Ionic bond?
13. What are the factors favorable for the formation of Ionic bond.
14. How do you predict the shapes of the following molecules making use of VSEPR theory?  
a)  $\text{Xe F}_2$     b)  $\text{Br F}_3$     c)  $\text{Cl F}_3$     d)  $\text{SF}_4$
15. Explain the structure of  $\text{CH}_4$  molecule.
16. Explain the hybridisation involved in  $\text{PCl}_5$  molecule.
17. Explain the hybridization involved in  $\text{SF}_6$  molecule.
18. What is Hydrogen bond? What are the different types of hydrogen bonds. Give example.
19. What is meant by bond order? Calculate the bond order in the following.  
a)  $\text{N}_2$     b)  $\text{O}_2$

### Chapter 4: STATES OF MATTER: GASES AND LIQUIDS

#### Very Short Answer Questions (01 Mark)

1. What is Ideal gas?
2. Give the values of gas constant in different units?
3. State Graham's law of diffusion?
4. How many times methane diffuse faster than sulphur dioxide
5. State Dalton's law of Partial Pressure?
6. Give the relation between the Partial Pressure of a gas and its mole fraction?
7. Give an equation to calculate the kinetic energy of gas molecules?
8. What is Boltzmann's constant? Give its value?
9. What is Rms speed?
10. What is Average speed?
11. What most probable speed?
12. What is surface tension.
13. Write the postulates of the kinetic molecular theory. (04 Marks)

## Chapter 5: STOICHEMISTRY

### Very Short Answer Questions (2 Marks)

- How many number of moles of glucose present in 540 gms of glucose.
- The empirical formula of a compound is  $\text{CH}_2\text{O}$  its molecular weight is 90. Calculate the molecular formula of the compound.
- Define the molar mass.
- Define normality?
- What are displacement reactions.
- Write formulas for the following compounds.
  - Mercury (II) Chloride
  - Nickel (II) Sulphate
  - Tin (IV) oxide
  - Thallium (I) Sulphate
  - Iron (III) Sulphate
  - Chromium (III) Oxide.
- Assign oxidation number to the underlined elements in each of the following species.
  - $\text{NaH}_2\text{PO_4}$
  - $\text{NaHSO}_4$
  - $\text{H}_4\text{P2O}_7$
  - $\text{K}_2\text{MnO}_4$
  - $\text{CaO}_2$
  - $\text{NaBH}_4$
  - $\text{H}_2\text{S2O}_7$

## Chapter 6: THERMODYNAMICS

### Very Short Answer Questions (2 Marks)

- State the first law of the thermodynamics. (2 Marks)
- What are intensive and extensive properties? (2 Marks)
- Define the Enthalpy of combustion? (2 Marks)
- State Hess's law of constant Heat summation? (1 Mark)
- Define Entropy, Gibbs energy? (1 Mark)
- State the second law of thermodynamics?
- State third law of thermodynamics?

## Chapter 7: CHEMICAL EQUILIBRIUM AND ACID - BASES

### Very Short Answer Questions (4 Marks)

- What is homogeneous equilibrium? Write two homogeneous reactions?
- What is heterogeneous equilibrium? Write two heterogeneous reactions.
- Write the relation between  $K_p$  and  $K_c$ .



31. Define law of mass action.
32. Discuss the application of Le-Chatelier's Principle for the industrial synthesis of Ammonia?
33. Discuss the application of Le-Chatelier's Principle for the industrial synthesis of sulphur trioxide.
34. Explain the Arrhenius concept of acids and bases?
35. What is a conjugate acid-base pair? Give Example.
36. Define Lewis Acids and Lewis bases?
37. Define  $P^H$ ?
38. Define ionic product of water? What is its value at room temperature?
39. Give two examples of salts whose aqueous solutions are basic?
40. Give two examples of salts whose aqueous solutions are acidic?
41. Define Buffer solution. Give example for acidic buffer and basic buffer solution.

## **Chapter 8: HYDROGEN AND ITS COMPOUNDS**

### ***Very Short Answer Questions (2 Marks)***

42. Describe one method of producing high quality hydrogen?
43. Why is dihydrogen used in welding of high melting metals?
44. Explain the terms hard water and soft water?
45. What is the chemical substance used in calgen method?
46. What are the uses of hydrogen fuel?
47. Mention three uses of  $H_2O_2$  in modern times?
48. Write any two methods of preparation of  $H_2O_2$ .

## **Chapter 9: THE S-BLOCK ELEMENTS**

### ***Short Answer Questions (4 Marks)***

49. Write completely the electronic configuration of K and Rb?
50. Lithium salts are mostly hydrated. Why?
51. In what respects lithium hydrogen carbonate differs from other alkali metal hydrogen carbonates?
52. Describe important uses of caustic soda?

53. Describe important uses of sodium carbonates?
54. Give an account of the biological importance of  $\text{Na}^+$  and  $\text{K}^+$  ions.
55. Write the complete electronic configurations of any two alkaline earth metals?
56. What happens when magnesium metal is burnt in air?
57. Lithium carbonate is not so stable to heat & the other alkali metal carbonates. Explain.
58. Why is gypsum added to cement?
59. Why are alkali metals not found in the free state in nature?
60. Describe the importance of plaster of Paris?
61. Give an account of the biological importance of  $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$  ions.

### **Chapter 10: THE P-BLOCK ELEMENTS – GROUP – 13.**

#### ***Very Short Answer Questions (2 Marks)***

62. Why does  $\text{BF}_3$  behave as a Lewis acid?
63. Explain inert pair effect?
64. Give the formula of borazine, What is its common name?
65. Give the formula of a) Borax b) colemanite
66. Give two uses of aluminum?
67. Explain the structure of diborane?
68. Give two uses of Aluminum.
69. What are electron deficient compounds?

### **Chapter 11: THE P-BLOCK ELEMENTS – GROUP – 14.**

#### ***Very Short Answer Questions (2 Marks)***

70. Give the hybridization of carbon in  
a)  $\text{CO}_3^{2-}$  b) diamond c) graphite d) fullerene
71. Why is CO poisonous?
72. What is allotropy? Give the crystalline allotropes of carbon?
73. Name any two man-made silicates?
74. Why does graphite function as a lubricant/
75. Graphite is a good conductor – explain?
76. What is synthesis gas?

77. What is producer gas?
78. How does CO<sub>2</sub> increases the green house effect?
79. Write the use of ZSM-5.
80. What is the use of dry ice?
81. Why is diamond hard?
82. Explain a) Allotropy b) inert pair effect c) catenation.

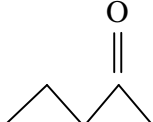
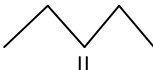
## Chapter 12: ENVIRONMENTAL CHEMISTRY

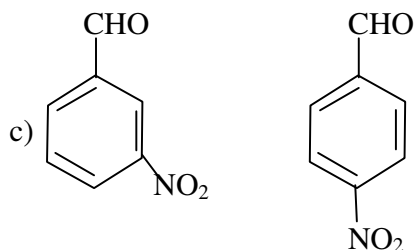
### Very Short Answer Questions (2 Marks)

83. List out four Gaseous pollutants present in the polluted air?
84. What are green house gases?
85. Which acids cause acid rain? And what is its p<sup>H</sup> value.
86. Name two adverse effects caused by acid rains?
87. What is ozone hole? Where was it first observed?
88. What is green house effect? And how is it caused?
89. What are the harmful effects caused by ozone layer depletion?
90. Define Eutrophication of lake?
91. What is the importance of Green Chemistry?

## Chapter 13: ORGANIC CHEMISTRY – SOME BASIC PRINCIPLES AND TECHNIQUES AND HYDRO CARBONS

### Very Short Answer Questions (2 Marks)

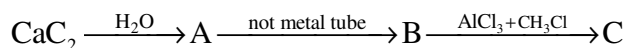
92. Write the reagents required for conversion of benzene to methyl benzene.
93. How is nitrobenzene prepared.
94. Write the IUPAC names of
95. a) CH<sub>3</sub> – CH<sub>2</sub> – CH<sub>2</sub> – CH = CH<sub>2</sub>. b)  



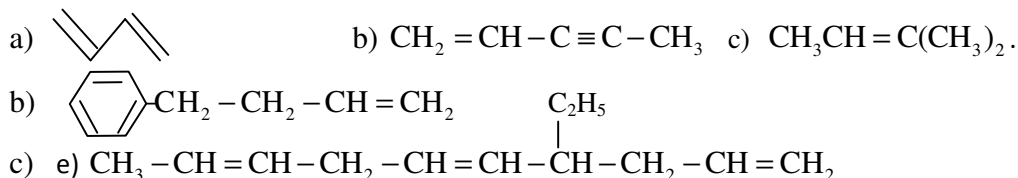
96. Write the structure of : a) Tri chloro ethanoic acid.  
 b) Neo pentane c) P-nitro benzal de hyde.

**Short Answer Questions (4 Marks)**

97. Complete the following reaction and name the products A, B, and C.



98. What is dehydro halogenation? Write the equation for the formation of alkene from alkyl halide.
99. Give two examples each for position and functional isomerism.
100. How is ethylene prepared from ethyl alcohol? Write the reaction.
101. What is the product formed when sodium propionate is heated with soda lime.
102. Write IUPAC names of the following compounds.



103. Describe two methods of preparation as ethane.
104. Describe two methods of preparation as ethylene.
105. Give two methods of preparation of acetylene.
106. Describe any two methods of preparation of benzene write equations.

**TELANGANA STATE BOARD OF INTERMEDIATE EDUCATION, HYDERABAD**

**VOCATIONAL BRIDGE COURSE**

**CHEMISTRY – Second Year (w.e.f. 2016-2017)**

**No. of Periods: 90**

**Periods Per Week: 03**

**WEIGHTAGE OF MARKS**

<b>S.No. Chapter No.</b>	<b>Chapters</b>	<b>Number of Periods</b>	<b>Weight age</b>
1.	Solid State	06	02
2.	Solutions	06	04
3.	Electrochemistry and Chemical Kinetics	10	04
4.	Surface Chemistry	06	04
5.	General Principles of Metallurgy	05	02
6.	p-BLOCK ELEMENTS Group – 15 Elements Group – 16 Elements Group – 17 Elements Group – 18 Elements	16	06
7.	d and f Block Elements Coordination Compounds	08	04
8.	Polymers	04	02
9.	Bio molecules	04	02
10.	Chemistry in Everyday Life	05	02
11.	Haloalkanes and Haloarenes	05	02
12.	Organic Compound Containing C, H and O (Alcohols, Phenols, Ethers, Aldehydes, Ketones and Carboxylic acids.	10	04
13.	Organic Compounds containing Nitrogen - Amines	05	02
<b>Total</b>		<b>90</b>	<b>40</b>

**TELANGANA STATE BOARD OF INTERMEDIATE EDUCATION, HYDERABAD**

**VOCATIONAL BRIDGE COURSE**

**CHEMISTRY – Second Year (w.e.f. 2016-2017)**

**MODEL QUESTION PAPER**

**Time: 1 ½ Hours**

**Max.Marks: 25**

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**Section – A**

**5x1=5**

**Note:**

i) *Answer any **five** of the following questions*

ii) *Each question carries **one** mark.*

1. Define the term amorphous.
2. What is Frankel defect
3. Explain Polling.
4. What is blister copper?
5. What is the structure of XeO<sub>3</sub>.
6. What is inert pair effect.
7. What is PHBV?
8. Write the name and structure of monomer is Bakelite?

**Section – B**

**5x4=20**

**Note:**

i) *Answer any **five** of the following questions*

ii) *Each question carries **four** marks.*

9. Define Molarity. Calculate the molarity of a solution containing 5g. of NaOH in 450ml of solution.
10. What are primary and secondary batteries. Give one example for each.
11. What is Catalysis? How is catalysis classified? Give two examples for each type of catalysis.
12. Describe the manufacture of H<sub>2</sub>SO<sub>4</sub> in contact process.
13. Explain Werner's theory of coordination compounds?
14. (a) Define Carbohydrates (b) What are antibiotics?
15. (a) Structure of 2-chloro-1phenyl butane (b) Write equation for Carbyl amine reaction.
16. (a) Cannizaro reaction (b) De carboxylation.

**TELANGANA STATE BOARD OF INTERMEDIATE EDUCATION, HYDERABAD**

**VOCATIONAL BRIDGE COURSE**

**CHEMISTRY – Second Year (w.e.f. 2016-2017)**

**QUESTION BANK**

**Chapter 1: SOLID STATE**

***Very Short Answer Questions (1 Mark)***

1. Define the term amorphous.
2. What is Shottky defect?
3. What is Frenkel defect?
4. Why X-rays are needed to probe the crystal structure?

***Short Answer Questions (4 Marks)***

5. Explain similarities and differences between metallic and ionic crystals.
6. Derive Bragg's equation.

**Chapter2: SOLUTIONS**

***Very Short Answer Questions (1 Mark)***

7. Define the term solution.
8. Define molarity.
9. Define molality.
10. Define mole fraction.
11. State Raoult's law.
12. State Henry's law.
13. Define osmotic pressure.
14. What are isotonic solutions?
15. Calculate the amount of benzoic acid ( $C_6H_5COOH$ ) required for preparing 250ml of 0.15M solution in methanol.

**Short Answer Questions (4 Marks)**

16. A solution of glucose in water is labeled as 10% w/w. What would be the molarity of the solution?
17. What is relative lowering of vapour pressure? How is it useful to determine the molar mass of a solute?
18. Determine the osmotic pressure of a solution prepared by dissolving 25mg of  $K_2SO_4$  in two litre of water at  $25^\circ C$  assuming that it is completely disassociated.
19. Calculate the amount of benzoic acid ( $C_6H_5COOH$ ) required for preparing 250ml of 0.15M solution in methanol.

**Chapter 3: ELECTROCHEMISTRY AND CHEMICAL KINETICS**

**Very Short Answer Questions (1 Mark)**

20. What is a galvanic cell or a voltaic cell? Give one example.
21. How is galvanic cell represented on paper as per IUPAC convention? Give one example.
22. State Faraday's first law of electrolysis.
23. State Faraday's second law of electrolysis.
24. What is a primary battery? Give one example.
25. Give one example for a secondary battery. Give the cell reaction.
26. Give the cell reaction of nickel-cadmium secondary battery.
27. What is a fuel cell? How is it different from a conventional galvanic cell?
28. What is metallic corrosion? Give one example.
29. Give the electro-chemical reaction that represents the corrosion or rusting of iron.
30. Define the speed or rate of a reaction.
31. What are the units of rate of reaction?
32. What is rate law? Illustrate with an example.
33. Define Order of a reaction. Illustrate your answer with an example.
34. Define molecularity of a reaction. Illustrate with an example.
35. What is the effect of temperature on the rate constant?



### **Short Answer Questions (4 Mark)**

36. What are galvanic cells. Explain the working of a galvanic cell with a neat sketch taking Daniel cell as example.
37. What is electrolysis? Give Faraday's first law of electrolysis.
38. What are primary and secondary batteries? Give one example for each.
39. What are fuel cells? How are they different from galvanic cells? Give the construction of H<sub>2</sub>, O<sub>2</sub> fuel cell.
40. What is metallic corrosion? Explain it with respect to iron corrosion.
41. Define and explain the order of a reaction. How is it obtained experimentally?
42. What is "molecularity" of a reaction? How is it different from the 'order' of a reaction? Name one bimolecular and one trimolecular gaseous reactions.

## **Chapter 4: SURFACE CHEMISTRY**

### **Very Short Answer Questions (1 Mark)**

43. What is adsorption ? Give one example.
44. What is absorption ? Give one example.
45. Distinguish between adsorption and absorption. Give one example of each.
46. Amongst adsorption, absorption which is a surface phenomena and why ?
47. What is the difference between physisorption and chemisorption?
48. Out of physisorption and chemisorption, which can be reversed ?
49. Define "promoters" and "poisons" in the phenomenon of catalysis.
50. What is homogeneous catalysis ? How is it different from heterogeneous catalysis?
51. Give two examples for homogeneous catalytic reactions.
52. Give two examples for heterogeneous catalysis.
53. Can catalyst increase the yield of reaction ?
54. What are lyophilic and lyophobic sols ? Give one example for each type.
55. Give two examples of lyophobic sols.
56. What is an emulsion ? Give two examples.

**Short Answer Questions (4 Marks)**

57. What are different types of adsorption ? Give any four differences between characteristics of these different types.
58. What is catalysis ? How is catalysis classified ? Give two examples for each type of catalysis.
59. How are colloids classified on the basis of nature of the dispersion medium?
60. How are colloids classified on the basis of interaction between dispersed phase and dispersion medium ?
61. How do emulsifiers stabilize emulsion ? Name two emulsifiers.

**Chapter 5: GENERAL PRINCIPLES OF METALLURGY**

**Very Short Answer Questions (1 Mark)**

62. What is the role of depressant in froth floatation ?
63. State the role of silica in the metallurgy of copper.
64. Explain "poling".
65. What is the role of cryolite in the metallurgy of aluminium ?
66. Give the composition of the following alloys.  
a) Brass            b) Bronze    c) German silver
67. Explain the terms gangue and slag.
68. Write any two ores with formulae of the following metals:  
a) Aluminium   b) Zinc      c) Iron      d) Copper
69. What is blister copper? Why is it so called ?
70. Explain magnetic separation of impurities from an ore.
71. Give two uses each of the following metals:  
a) Zinc            b) Copper    c) Iron      d) Aluminium

**Short Answer Questions (4 Marks)**

72. Explain Zone refining
73. Giving examples to differentiate roasting and calcination.
74. Explain the purification of sulphide ore by froth floatation method.

## Chapter 6: *p*-BLOCK ELEMENTS

### GROUP 15 ELEMENTS

#### *Very Short Answer Questions (1 Mark)*

75. Why are the compounds of bismuth more stable in +3 oxidation state ?
76. What is inert pair effect ?

#### *Short Answer Questions (4 Marks)*

77. Discuss the general characteristics of Group – 15 elements with reference to their electronic configuration, oxidation state, atomic size, ionization enthalpy and electronegativity.
78. Discuss the trends in chemical reactivity of group – 15 elements.

### GROUP 16 ELEMENTS

#### *Very Short Answer Questions (1 Mark)*

79. How does ozone react with ethylene ?
80. Write any two uses each for O<sub>3</sub> and H<sub>2</sub>SO<sub>4</sub>.

#### *Short Answer Questions (4 Marks)*

81. Describe the manufacture of H<sub>2</sub>SO<sub>4</sub> by contact process.
82. How is ozone prepared? How does it react with the following ?  
a) PbS      b) KI    c) Hg    d) Ag
83. Complete the following  
a)  $\text{KCl} + \text{H}_2\text{SO}_4 (\text{conc}) \longrightarrow$       b)  $\text{Sucrose} \xrightarrow{\text{Conc. H}_2\text{SO}_4}$   
b)  $\text{Cu} + \text{H}_2\text{SO}_4 (\text{conc}) \longrightarrow$       d)  $\text{C} + \text{H}_2\text{SO}_4 (\text{conc}) \longrightarrow$

### GROUP 17 ELEMENTS

#### *Very Short Answer Questions (1 Mark)*

84. What happens when Cl<sub>2</sub> reacts with dry slaked lime ?
85. Chlorine acts as an oxidizing agent – explain with two examples.
86. How is chlorine manufactured by Deacon's method ?
87. Chlorine acts as a bleaching agent only in the presence of moisture – explain.

**Short Answer Questions (4 Marks)**

88. How can you prepare  $\text{Cl}_2$  from  $\text{HCl}$  and  $\text{HCl}$  from  $\text{Cl}_2$  ? Write the reactions.

**GROUP 18 ELEMENTS**

**Very Short Answer Questions (1 Mark)**

89. Which of the following does not exist ?  
a)  $\text{XeOF}_4$    b)  $\text{NeF}_2$    c)  $\text{XeF}_2$    d)  $\text{XeF}_6$
90. Explain the structure of  $\text{XeO}_3$ .

**Short Answer Questions (4 Marks)**

91. Explain the structures of a)  $\text{XeF}_2$  and b)  $\text{XeF}_4$
92. Explain the structures of a)  $\text{XeF}_6$  and b)  $\text{XeOF}_4$

**Chapter 7: d- and f- BLOCK ELEMENTS and COORDINATION COMPOUNDS**

**Very Short Answer Questions (1 Mark)**

93. What are transition elements ? Give examples.
94. Why are d-block elements called transition elements?
95. Write the electronic configuration of  $\text{Co}^{2+}$  and  $\text{Mn}^{2+}$ .
96. Why  $\text{Zn}^{2+}$  is diamagnetic whereas  $\text{Mn}^{2+}$  is paramagnetic?
97. Aqueous  $\text{Cu}^{2+}$  ions are blue in colour, where as Aqueous  $\text{Zn}^{2+}$  ions are colourless. Why?
98. What are complex compounds? Give examples
99. What is an alloy? Give example.
100. What is lanthanoid contraction?
101. What are coordination compounds? Give two examples.
102. What is a ligand?

### **Short Answer Questions (4 Marks)**

103. Why do the transition metal ions exhibit characteristic colours in aqueous solution. Explain giving examples.
104. Explain the catalytic action of Iron(III) in the reaction between  $\Gamma^-$  and  $S_2O_8^{2+}$  ions.
105. Explain Werner's theory of coordination compounds with suitable examples.
106. Using IUPAC norms write the formulas for the following:
- (i) Tetrahydroxozincate(II)      (ii) Hexaamminecobalt(III) sulphate
- (iii) Potassium tetrachloropalladate(II) and
- (iv) Potassium tri(oxalato)chromate(III)
107. Using IUPAC norms write the systematic names of the following:
- (i)  $[Co(NH_3)_6]Cl_3$  (ii)  $[Pt(NH_3)_2Cl(NH_2CH_3)]Cl$  (iii)  $[Ti(H_2O)_6]^{3+}$  and (iv)  $[NiCl_4]^{2-}$

## **Chapter 8: POLYMERS**

### **Very Short Answer Questions (1 Mark)**

108. What are polymers ? Give example.
109. What is vulcanization of rubber ?
110. What is biodegradable polymer ? Give one example of a biodegradable polyester?
111. What is PHBV ? How is it useful to man ?

### **Short Answer Questions (4 Marks)**

112. Write the names and structures of the monomers used for getting the following polymers (i) Polyvinyl chloride (ii) Teflon (iii) Bakelite (iv) Polystyrene.
113. Explain the purpose of vulcanization of rubber.

## **Chapter 9: BIOMOLECULES**

### **Very Short Answer Questions (1 Mark)**

114. Define Carbohydrates.
115. Name the different types of carbohydrates on the basis of their hydrolysis. Give one example for each.
116. Name the vitamin responsible for the coagulation of blood.
117. Why are vitamin A and vitamin C essential to us? Give their important sources.

**Short Answer Questions (4 Marks)**

118. Write the importance of carbohydrates.
119. Explain the denaturation of proteins.
120. What are enzymes ? Give examples.
121. Write notes on vitamins.
122. What are hormones ? Give one example for each.  
(i) steroid hormones (ii) Poly peptide hormones and (iii) amino acid derivatives.
123. Give the sources of the following vitamins and name the diseases caused by their deficiency (a) A (b) D (c) E and (d) K

**Chapter 10: CHEMISTRY IN EVERYDAY LIFE**

**Very Short Answer Questions (1 Mark)**

124. What are drugs ?
125. What are antacids ? Give example.
126. What are antihistamines ? Give example.
127. What are tranquilizers? Give example.
128. What are analgesics? How are they classified?
129. What are narcotic analgesics? Give example .
130. What are non-narcotic analgesics? Give example.
131. What are antimicrobials?
132. What are antibiotics? Give example.
133. What are antiseptics? Give example.
134. What are disinfectants? Give example.
135. What are artificial sweetening agents? Give example.
136. Why do we require artificial sweetening agents?
137. What are food preservatives? Give example.
138. What are soaps chemically?

**Short Answer Questions (4 Marks)**

139. What are analgesics ?How are they classified ? Give examples.
140. What are different types of microbial drugs? Give one example for each.

141. Write the characteristic properties of antibiotics.
142. What are broad spectrum and narrow spectrum antibiotics? Give one example for each.
143. Write notes on antiseptics and disinfectants.
144. What are the main categories of food additives?

## Chapter 11: HALOALKANES AND HALOARENES

### *Very Short Answer Questions (1 Mark)*

145. Write the structures of the following compounds.
  - (i) 2-chloro-3-methylpentane
146. What are ambident nucleophiles?
147. What are Enantiomers?
148. Give the IUPAC names of the following compounds:
  - (i)  $\text{ClCH}_2\text{CH}=\text{CHCH}_2\text{Br}$
149. Write the structures of the following organic halides.
  - (i) 2-Chloro-1-phenylbutane
  - (ii) p-bromochlorobenzene

### *Short Answer Questions (4 Marks)*

150. A hydrocarbon  $\text{C}_5\text{H}_{10}$  does not react with chlorine in dark but gives a single monochloro compound  $\text{C}_5\text{H}_9\text{Cl}$  in bright sunlight. Identify the hydrocarbon.
151. How will you carry out the following conversions? i). Ethane to bromomethane

## Chapter 12: ORGANIC COMPOUNDS CONTAINING C, H AND O

(Alcohols, Phenols, Ethers, Aldehydes, Ketones and Carboxylic Acids)

### ALCOHOLS, PHENOLS, ETHERS

#### *Very Short Answer Questions (1 Mark)*

152. Give the reagents used for the preparation of phenol from chlorobenzene.
153. Name the reagents used in the following reactions.
  - i). Oxidation of primary alcohol to carboxylic acid
  - ii). Oxidation of primary alcohol to aldehyde

154. Write the equations for the following reactions.
- Bromination of phenol to 2,4,6-tribromophenol
  - Benzyl alcohol to benzoic acid.
155. Write the structures for the following compounds
- Ethoxyethane
  - Ethoxybutane
  - Phenoxyethane

**Short Answer Questions (4 Marks)**

156. Give the equations for the preparation of phenol from Cumene.
157. Explain the acidic nature of phenols and compare with that of alcohols.
158. Ethanol with  $\text{H}_2\text{SO}_4$  at 443K forms ethane while at 413 K it forms ethoxy ethane. Explain the mechanism.
159. With a suitable example write equations for the following:
- Reimer-Tiemann reaction.
  - Williamson's ether synthesis.
160. How are the following conversions carried out?
- Benzyl chloride to Benzyl alcohol
  - 2-butanone to 2-butanol
161. Write the names of the reagents and equations for the preparation of the following ethers by Williamson's synthesis:
- 1-Propoxypropane
  - 1-Methoxyethane

**ALDEHYDES, KETONES AND CARBOXYLIC ACIDS**

**Very Short Answer Questions (1 Mark)**

162. Write the reaction showing  $\alpha$  – halogenations of carboxylic acid and give its name.
163. List the reagents needed to reduce carboxylic acid to alcohol.
164. Compare the acidic strength of acetic acid, Chloroacetic acid, benzoic acid and Phenol.

**Short Answer Questions (4 Marks)**

165. Write the oxidation products of: Acetaldehyde, Acetone and Acetophenone
166. Describe the following:
- Cross aldol condensation
  - Decarboxylation



167. Explain the following terms. Give an example of the reaction in each case.

i). Cyanohydrin ii). Aldol iii). Oxime

168. Describe the following.

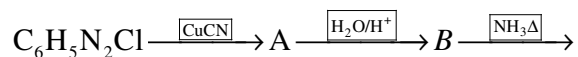
i). Cannizaro reaction ii). Decarboxylation

### Chapter 13: ORGANIC COMPOUNDS CONTAINING NITROGEN (Amines, Diazonium Salts, Alkyl Cyanides & Alkyl Isocyanides)

#### Very Short Answer Questions (1 Mark)

169. Write equations for Carbylamine reaction of any one aliphatic amine.

170. Give structures of A,B and C in the following reaction.



171. Accomplish the following conversions:

i). Benzoic acid to benzamide ii). Aniline to p-bromoaniline

#### Short Answer Questions (4 Marks)

172. Give one chemical test to distinguish between the following pairs of compounds.

i) Methylamine and dimethylamine

ii) Aniline and N-methylaniline

iii) Ethylamine and aniline

173. How do you prepare Ethyl cyanide and Ethyl isocyanide from a common alkylhalide?

**TELANGANA STATE BOARD OF INTERMEDIATE EDUCATION, HYDERABAD**

**VOCATIONAL BRIDGE COURSE**

**CHEMISTRY (Practicals) (w.e.f. 2016-2017)**

**Model Question Paper with Scheme of Valuation**

**With effect from IPE March - 2017**

**Time: 1 ½ Hours**

**Max.Marks: 25**

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**I. Qualitative Analysis**

**10 Marks**

1. Physical state, colour and Actions of heat (½ + ½ + 1 = 2 Marks)
2. Identification of Anion 2 Marks
3. Confirmation test for Anion 2 Marks
4. Identification test of cation 2 Marks
5. Confirmation test for cation 1 Mark
6. Report 1 Mark

**II. Titrimetric Analysis (Volumetric Analysis) 10 Marks**

1. Procedure in the first 10 mts with equation 2 + 1 = 3 Marks
2. Titration and Tabulation with values 4 Marks
3. For indicating the formula 1 Mark
4. For calculation and Report 2 Marks

**III. Record**

5 Marks

**Total: 25 Marks**

**TELANGANA STATE BOARD OF INTERMEDIATE EDUCATION, HYDERABAD**

**VOCATIONAL BRIDGE COURSE**

**CHEMISTRY PRACTICALS (w.e.f. 2016-2017)**

**Question Bank for Qualitative Analysis**

**S.No. Salt Name**

1. Aluminum Nitrate ,  $Al(NO_3)_3$
2. Ammonium carbonate,  $(NH_4)_2CO_3$
3. Barium Bromide,  $BaBr_2$
4. Calcium chloride,  $CaCl_2$
5. Copper sulphate,  $CuSO_4$
6. Ferrous sulphate,  $FeSO_4$
7. Lead Nitrate,  $Pb(NO_3)_2$
8. Magnesium Chloride,  $MgCl_2$
9. Magnesium Chloride,  $MnCl_2$
10. Zinc sulphate.,  $ZnSO_4$ .

**I. Qualitative analysis.**

- Q: Identify of anion and cation in the given salt by systematic procedure and report name of salt. 10 Marks

**TELANGANA STATE BOARD OF INTERMEDIATE EDUCATION, HYDERABAD**

**VOCATIONAL BRIDGE COURSE**

**CHEMISTRY PRACTICALS (w.e.f. 2016-2017)**

**Question Bank for Titrimetric Analysis (Volumetric Analysis)**

**SECTION – A**

01. Estimate the amount of Hydrochloric acid present in 1000 ml of the given solution. 0.05 M Sodium Carbonate solution is supplied.
02. Estimate the amount of Sodium Carbonate present in 500 ml of the given solution. 0.1M Hydrochloric acid solution is supplied.

**SECTION – B**

03. Estimate the amount of Oxalic acid present in 250 ml of the given solution. 0.2M Sodium Hydroxide acid solution is specified.
04. Estimate the amount of Sodium Hydroxide present in 100 ml of the given solution. 0.1M Oxalic acid solution is supplied.

**SECTION – C**

05. Estimate the amount of Oxalic acid present in 1000 ml of the given solution. 0.02M Potassium permanganate solution is supplied.
06. Estimate the amount of Potassium Permanganate present in 500 ml of the given solution. 0,05M Oxalic acid solution is supplied.

**SECTION – D**

07. Estimate the amount of Ferrous Ammonium Sulphate present in 250 ml of the given solution. 0.02 M Potassium Permanganate solution is supplied.
08. Estimate the amount of Potassium Permanganate present in 100 ml of the given solution. 0.1 M Ferrous Ammonium Sulphate solution is supplied.

**TELANGANA STATE BOARD OF INTERMEDIATE EDUCATION, HYDERABAD**

**VOCATIONAL BRIDGE COURSE**

**First Year - Paper – I (w.e.f. 2016-2017)**

**MATHEMATICS SYLLABUS**

**UNIT – I**

**ALGEBRA**

**01 Functions (12 hours)**

- 1.1 Types of functions – Definitions and Theorems (without proofs)
- 1.2 Inverse functions and Theorems (without proofs)

**02 Mathematical Induction (05 hours)**

- 2.1 Principle of Mathematical Induction – Statement
- 2.2 Application of Mathematical Induction (Simple problems)

**03 Matrices (05 hours)**

- 3.1 Types of Matrices – Definitions
- 3.2 Scalar multiple of a matrix and multiplication of matrices.
- 3.3 Transpose of a matrix
- 3.4 Determinants – Properties of determinants (Simple problems)
- 3.5 Adjoint and Inverse of a matrix- Theorems without proof
- 3.6 Solving simultaneous linear equations – Cramer’s rule and Matrix Inversion method

**UNIT – II**

**VECTOR ALGEBRA**

**04 Addition of Vectors (08 hours)**

- 4.1 Vectors as a triad of real numbers – some basic concepts
- 4.2 Classification of vectors
- 4.3 Addition of vectors

- 4.4 Scalar multiplication of a vector
- 4.5 Angle between two non- zero vectors
- 4.6 Vector equations of line and plane

**05 Product of Vectors (08 hours)**

- 5.1 Scalar Product of two vectors – Definition and simple problems
- 5.2 Properties of Scalar product
- 5.3 Expression for Scalar (dot) product, Angle between two vectors
- 5.4 Vector product (cross product) of two vectors and properties
- 5.5 Vector product in  $(\bar{i}, \bar{j}, \bar{k})$  system
- 5.6 Vector Areas
- 5.7 Scalar Triple Product - Vector triple product Definitions and simple problems

**UNIT – III**

**TRIGONOMETRY**

**06 TRIGONOMETRIC RATIOS UPTO TRANSFORMATIONS (12 hours)**

- 6.1 Trigonometric Ratios – Variation – Simple problems
- 6.2 Trigonometric Ratios of compound angles – Simple problems
- 6.3 Trigonometric Ratios of multiple and sub multiple angles – Simple problems
- 6.4 Sum and product – Transformations – Simple problems – Problems on identities

**07 TRIGONOMETRIC EQUATIONS (05 hours)**

- 7.1 General solutions of trigonometric equations  
– Simple problems

**08 HYPERBOLIC FUNCTIONS (02 hours)**

- 8.1 Definitions of hyperbolic functions – Simple problems

**UNIT – IV**  
**CALCULUS**

**09 LIMITS AND CONTINUITY (08 hours)**

9.1 Limits – Standard Formulae (without proofs) – Simple problems

9.2 Continuity – definition and simple problems.

**10 DIFFERENTIATION (12 hours)**

10.1 DERIVATIVE – Definition – Elementary properties – Simple problems.

10.2 Trigonometric, Inverse Trigonometric, Hyperbolic, Inverse Hyperbolic functions  
– Derivatives – Simple problems

**11 APPLICATIONS OF DERIVATIVES (12 hours)**

11.1 Errors and approximations

11.2 Geometrical Interpretation of a derivative

11.3 Equations of Tangents and Normals

11.4 Lengths of Tangent, Normal, Sub tangent and sub normal

11.5 Angle between two curves – condition of orthogonality

11.6 Derivative as rate of change.

**UNIT – V**

**CO-ORDINATE GEOMETRY (2-D & 3-D)**

**12 LOCUS (04 hours)**

12.1 Locus – Definition – Illustrations – Simple problems

**13 TRANSFORMATION OF AXES (04 hours)**

13.1 Translation of axes – Rules and simple problems

13.2 Rotation of axes – Rules and simple problems.

**14 THE STRAIGHT LINE (14 hours)**

- 14.1 Equation of Straight line – various forms – Illustrations - simple problems
- 14.2 Intersection of two straight lines.
- 14.3 Family of straight lines - Concurrent lines.
- 14.4 Condition for Concurrent lines
- 14.5 Angle between two lines
- 14.6 Length of the perpendicular from a point to a line
- 14.7 Distance between two parallel lines.
- 14.8 Concurrent lines - properties related to a triangle (without proof) – only problems

**15 PAIR OF STRAIGHT LINES (18 hours)**

- 15.1 Introduction - Equations of a pair of lines passing through origin, angle between a pair of lines
- 15.2 Condition for perpendicular and coincident lines, bisector of angles
- 15.3 Pair of bisectors of angles
- 15.4 Pair of lines - second degree general equation
- 15.5 Conditions for parallel lines – Distance between them, Point of intersection of pair of lines
- 15.6 Homogenising a second degree equation with a first degree equation in x and y.

**16 THREE DIMENSIONAL CO-ORDINATES (04 hours)**

- 16.1 Co-ordinates – simple problems
- 16.2 Section formula – Centroid of triangle – Centroid of tetrahedron.
- 16.3 Simple problems related to centroid.

**17 DIRECTION COSINES AND DIRECTION RATIOS (06 hours)**

- 17.1 Direction Cosines - simple problems
- 17.2 Direction ratios - simple problems

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**TELANGANA STATE BOARD OF INTERMEDIATE EDUCATION, HYDERABAD**

**VOCATIONAL BRIDGE COURSE**

**First Year - Paper – I (w.e.f. 2016-2017)**

**MATHEMATICS WEIGHTAGE OF MARKS**

<b>S.No.</b>	<b>Unit</b>	<b>Weightage of Marks</b>
1.	Algebra	28
2.	Calculus	29
3.	Coordinate Geometry	31
4.	Trigonometry	32
<b>Total</b>		<b>120 Marks</b>

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**TELANGANA STATE BOARD OF INTERMEDIATE EDUCATION, HYDERABAD**  
**VOCATIONAL BRIDGE COURSE**

**First Year - Paper – I (w.e.f. 2016-2017)**

**MATHEMATICS SCHEME OF EXIMATION (WEIGHTAGE)**

**Total Questions : 15**

**Time: 3 Hours**

**Max.Marks: 75**

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**Note:** In section A – Answer all Questions  
In section B – Answer any three Questions

**Section – A**

**10x3=30**

**Note:**

- i) *Answer all the questions*
  - ii) *Each question carries 2 marks.*
1. From Algebra
  2. From Algebra
  3. From Calculus
  4. From Calculus
  5. From Co-ordinate Geometry
  6. From Co-ordinate Geometry
  7. From Co-ordinate Geometry
  8. From Trigonometry
  9. From Trigonometry
  10. From Trigonometry

**Section – B**

**3x15=45**

**Note:**

- i) *Answer any 3 questions*
  - ii) *Each question carries 15 marks.*
11. From Algebra with internal choice
  12. From Calculus with internal choice
  13. From Co-ordinate Geometry with internal choice
  14. From Trigonometry with internal choice
  15. I(a) – From Algebra  
I(b) – From Calculus
- OR**
- II(a) – from Co-ordinate Geometry
  - II(b) – from Trigonometry

**TELANGANA STATE BOARD OF INTERMEDIATE EDUCATION, HYDERABAD**

**VOCATIONAL BRIDGE COURSE**

**MATHEMATICS – First Year (w.e.f. 2016-2017)**

**MODEL QUESTION PAPER**

**Time: 3 Hours**

**Max.Marks: 75**

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**Section – A**

**10x3=30**

**Note:**

i) Answer **all** questions

ii) Each question carries **3** marks.

1. A function  $f : A \rightarrow B$  is defined by  $f(x) = x^2 + x + 1$ .

If  $A = \{-2, -1, 0, 1, 2\}$ , then find B.

2. If the vectors  $-3\bar{i} + 4\bar{j} + p\bar{k}$  and  $q\bar{i} + 8\bar{j} + 6\bar{k}$  are collinear, then find  $p$  and  $q$ .

3. Evaluate:  $\lim_{x \rightarrow 2} \frac{2x^2 - 7x - 4}{(2x - 1)}$

4. Find  $\frac{d}{dx} \left( \frac{\cos x}{\cos x + \sin x} \right)$ .

5. A point P moves such that  $PA = PB$  where  $A = (-3, 2)$  and  $B = (0, 4)$ . Find the equation to the locus of P.

6. Transform the line equation of the line  $x + y + 2 = 0$  into

(i) slope – intercept form (ii) intercept form (iii) normal form.

7. The three consecutive vertices of a parallelogram are given as  $(2, 4, -1)$ ,  $(3, 6, -1)$ ,  $(4, 5, 1)$ .

Find the fourth vertex.

8. Simplify:  $\sin 330^\circ \cdot \cos 120^\circ + \cos 210^\circ \cdot \sin 300^\circ$ .

9. Simplify:  $\frac{3 \cos \theta + \cos 3\theta}{3 \sin \theta - \sin 3\theta}$

10. If  $\sinh x = \frac{3}{4}$ , find  $\cosh(2x)$  and  $\sinh(2x)$ .

## Section – B

3x15=45

**Note:**

- i) Answer any 3 questions  
 ii) Each question carries 15 marks.

11. I (a) Prove by using induction Principle:

$$1^2 + 2^2 + 3^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$$

I (b) If  $A = \begin{pmatrix} 1 & -2 & 3 \\ 0 & -1 & 4 \\ -2 & 2 & 1 \end{pmatrix}$ , then find  $(A^{-1})^{-1}$ .

**OR**

II (a) Prove  $\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} = (a-b)(b-c)(c-a)$ .

II (b) If  $\bar{a} = (1, -2, 1)$ ,  $\bar{b} = (2, 1, 1)$ ,  $\bar{c} = (1, 2, -1)$  then find  $|\bar{a} \times (\bar{b} \times \bar{c})|$  and  $|(\bar{a} \times \bar{b}) \times \bar{c}|$

12. I (a) Evaluate  $\lim_{x \rightarrow 0} \left[ \frac{\sin(a+bx) - \sin(a-bx)}{x} \right]$

I (b) Find the derivative of  $x^2 + 2$  from definition method.

**OR**

II (a) Show that  $f(x) = \frac{\cos ax - \cos bx}{x^2}, x \neq 0$   
 $= \frac{1}{2}(b^2 - a^2), x = 0$

where  $a$  and  $b$  are real constants, is continuous at  $x = 0$

II (b) Find the equations of tangent and normal to the curve  
 $y = x^4 - 6x^3 + 13x^2 - 10x + 5$  at the point  $(0, 5)$ .

13. I (a) Find the foot of the perpendicular drawn from the point  $(3, 0)$  upon the straight line  $5x + 12y - 41 = 0$ .

I (b) Find the equation to the straight line which passes through  $(0, 0)$  and also the point of intersection of the lines  $x + y + 1 = 0$  and  $2y - y + 5 = 0$ .

**OR**

II (a) When the axes are rotated through an angle  $\frac{\pi}{4}$ , find the transformed equation of  $3x^2 + 10xy + 3y^2 = ?$

II (b) If  $(6,10,10), (1,0,-5), (6,-10,0)$  are the vertices of a triangle, find the direction ratios of its sides. Also, show that it is a right angled triangle.

14. I (a) If  $\sin(A+B) = \frac{24}{25}$  and  $\cos(A-B) = \frac{4}{5}$  where  $0 < A < B < \frac{\pi}{4}$ , then find the value of the  $2A$ .

I (b) Solve:  $\sin^2 \theta - \cos \theta = \frac{1}{4}$

**OR**

II (a) If  $A+B+C = \frac{\pi}{2}$ , then prove that  $\cos 2A + \cos 2B + \cos 2C = 1 + 4 \sin A \sin B \sin C$ .

II (b) If  $x+y = \frac{2\pi}{3}$  and  $\sin x + \sin y = \frac{3}{2}$ , then find  $x$  and  $y$ .

15. I (a) Solve  $2x - y + 3z = 9$ ,  $x + y + z = 6$ ,  $x - y + z = 2$  by matrix inversion method.

I (b) Show that the curves  $x^2 + y^2 = 2$  and  $3x^2 + y^2 = 4x$  have a common tangent at the point  $(1,1)$ .

**OR**

II (a) Find  $K$ , if the lines joining origin to the points of intersection of the curve  $2x^2 - 2xy + 3y^2 + 2x - y - 1 = 0$  and the line  $x + 2y = k$  are mutually perpendicular.

II (b) Prove  $\cos \frac{2\pi}{7} \cos \frac{4\pi}{7} \cos \frac{6\pi}{7} = \frac{1}{8}$ .

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**QUESTION BANK**

**Chapter-1: FUNCTIONS**

**Short Answer Questions (1 Mark)**

1. If  $A = \left\{0, \frac{\lambda}{6}, \frac{\lambda}{4}, \frac{\lambda}{3}, \frac{\lambda}{2}\right\}$  and  $f : A \rightarrow B$  in onto  $f(x) = \cos x$  then find B.
2. If  $A = \{-2, -1, 0, 1, 2\}$   $f : A \rightarrow B$ ,  $f(x) = x^2 + x + 1$  then find B.
3. If  $f \{(1,2)(2,-3)(3,1)\}$  then find 1)  $2f$  2)  $f^2$  3)  $f + 2$  4)  $\sqrt{f}$
4. If  $f = \{(4,5)(5,6)(6,-4)\}$  and  $g = \{(4,-4)(6,5)(8,5)\}$  then find  
1)  $f + g$  2)  $f - g$  3)  $2f + 4g$  4)  $f + 4$  5)  $fg$  6)  $\frac{f}{g}$  7)  $|f|$  8)  $\sqrt{f}$  9)  $f^2$  10)  $f^3$
5.  $f(x) = 2x - 1$  and  $g(x) = x^2$  then find  
(i)  $(3f - 2g)(x)$  (ii)  $(fg)(x)$  (iii)  $\left(\frac{\sqrt{f}}{g}\right)(x)$  (iv)  $(f + g + 2)(x)$ .
6. If  $f(x) = \frac{1-x^2}{1+x^2}$  then show that  $f(\tan \theta) = \cos 2\theta$ .
7. If  $f(x) = \log \left| \frac{1+x}{1-x} \right|$  then show that  $f\left(\frac{2x}{1+x^2}\right) = 2f(x)$ .
8. If  $f(x) = 4x - 1$   $g(x) = x^2 + 2$  then find  
(i)  $(gof)(x)$  (ii)  $go(fof)(o)$  (iii)  $(gof)\left(\frac{a+1}{4}\right)$  (iv)  $(fof)(x)$ .
9.  $f(x) = 2$ ,  $g(x) = x^2$ ,  $h(x) = 2x$  then find  $(fogoh)(x)$ .
10. If  $f(x) = ax + b$  then find  $f^{-1}(x)$ .
11. If  $f(x) = 5^x$  then find  $f^{-1}(x)$ .
12. If  $f(x) = 2x - 3$ ,  $g(x) = x^3 + 5$  then find  $(fog)^{-1}(x)$ .
13. If  $f(x) = \frac{x+1}{x-1}$  then find  $(fof)(x)$ .

14. If  $f(x) = \frac{1}{x}$   $g(x) = \sqrt{x}$  then find  $(gof)(x)$  and  $g\sqrt{f}$ .

15. If  $A = \{1, 2, 3, 4\}$  and  $f : A \rightarrow R$  and  $f(x) = \frac{x^2 - x + 1}{x + 1}$  then find the range of  $f$ .

## Chapter-2: MATHEMATICAL INDUCTION

1. Prove that  $1 + 2 + 3 + \dots + n = \frac{n(n+1)}{2}$  using Mathematical Induction.

2. Prove that  $1^2 + 2^2 + 3^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$  using Mathematical Induction.

3. Prove that  $1^3 + 2^3 + 3^3 + \dots + n^3 = \frac{n^2(n+1)^2}{4}$  using Mathematical Induction.

4. Prove that  $1 + 3 + 5 + \dots + 2n - 1 = n^2$  using Mathematical Induction.

5. Prove that  $a + (a+d) + (a+2d) + \dots + a + (n-1)d = \frac{n}{2}[2a + (n-1)d]$  using Mathematical Induction.

6. Prove that  $a + ar + ar^2 + ar^3 + \dots + ar^{n-1} = \frac{a(r^n - 1)}{r - 1}$  using Mathematical Induction.

7. Prove that  $3 + 3^2 + 3^3 + \dots + 3^n = \frac{3}{2}(3^n - 1)$  using Mathematical Induction.

8. Prove that  $1.2.3 + 2.3.4 + 3.4.5 + \dots + n \text{ terms} = \frac{n(n+1)(n+2)(n+3)}{4}$  using Mathematical Induction.

9. Prove that  $\frac{1}{1.3} + \frac{1}{3.5} + \frac{1}{5.7} + \dots + n \text{ terms} = \frac{n}{2n+1}$  using Mathematical Induction.

10. Prove that  $\frac{1}{1.4} + \frac{1}{4.7} + \frac{1}{7.10} + \dots + n \text{ terms} = \frac{n}{3n+1}$  using Mathematical Induction.

11. Prove that  $2 + 7 + 12 + \dots + (5n - 3) = \frac{n(5n - 1)}{2}$  using Mathematical Induction.

12. Prove that  $4^3 + 8^3 + 12^3 + \dots + n \text{ terms} = 16n^2(n+1)^2$  using Mathematical Induction.

13. Prove that  $\frac{1}{1.2} + \frac{1}{2.3} + \frac{1}{3.4} + \dots + \frac{1}{n(n+1)} = \frac{n}{n+1}$  using Mathematical Induction.

14. Prove that  $2 + 3.2 + 4.2 + \dots + n \text{ terms} = n.2^n$  using Mathematical Induction.

15. Prove that  $2.3 + 3.4 + 4.5 + \dots + n \text{ terms} = \frac{n(n^2 + 6n + 11)}{3}$  using Mathematical Induction.

## Chapter-2: MATRICES

1. If  $A = \begin{bmatrix} 3 & 9 & 0 \\ 1 & 8 & -2 \end{bmatrix}$  and  $B = \begin{bmatrix} 4 & 0 & 2 \\ 7 & 1 & 4 \end{bmatrix}$  then find  $A + B$ .
2. If  $A = \begin{bmatrix} 1 & 2 & 3 \\ 3 & 2 & 1 \end{bmatrix}$ ,  $B = \begin{bmatrix} 3 & 2 & 1 \\ 1 & 2 & 3 \end{bmatrix}$  then find  $3B - 2A$ .
3. If  $A = \begin{bmatrix} 0 & 1 & 2 \\ 2 & 3 & 4 \\ 4 & 5 & 6 \end{bmatrix}$ ,  $B = \begin{bmatrix} 1 & -2 & 0 \\ 0 & 1 & -1 \\ -1 & 0 & 3 \end{bmatrix}$  then find  $A - B$  and  $4B - 3A$ .
4. If  $A = \begin{bmatrix} 2 & 3 & 1 \\ 6 & -1 & 5 \end{bmatrix}$ ,  $B = \begin{bmatrix} 1 & 2 & -1 \\ 0 & -1 & 3 \end{bmatrix}$  and  $A + B - X = [0]$  then find the matrix  $X$ .
5. Find the trace of the Matrix  $\begin{bmatrix} 1 & 3 & -5 \\ 2 & -1 & 5 \\ 1 & 0 & 1 \end{bmatrix}$ .
6. If  $A = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$  and  $B = \begin{bmatrix} 0 & 4 \\ -1 & 2 \end{bmatrix}$  then find  $AB$  and  $BA$ .
7. If  $A = \begin{bmatrix} 4 & 2 \\ -1 & 1 \end{bmatrix}$  then find  $A^2$ .
8. If  $A = \begin{bmatrix} 2 & 4 \\ -1 & K \end{bmatrix}$  and  $A^2 = [0]$  then find  $K$ .
9. If  $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$  then show that  $A^2 - 4A - 5I = [0]$
10. If  $A = \begin{bmatrix} i & 0 \\ 0 & -i \end{bmatrix}$  then show that  $A^2 = -I$ .
11. If  $A = \begin{bmatrix} 2 & -4 \\ -5 & 3 \end{bmatrix}$  then find  $A + A^T$ .
12. If  $A = \begin{bmatrix} 2 & -4 \\ -5 & 3 \end{bmatrix}$  then find  $AA^T$ .



13. If  $A = \begin{bmatrix} -2 & 1 \\ 5 & 0 \\ -1 & 4 \end{bmatrix}$ ,  $B = \begin{bmatrix} -2 & 3 & 1 \\ 4 & 0 & 2 \end{bmatrix}$  then find  $2A + B^T$ .
14. If  $A = \begin{bmatrix} 2 & -4 \\ -5 & 3 \end{bmatrix}$  then find  $AA^T$ .
15. If  $A = \begin{bmatrix} -1 & 2 & 3 \\ 2 & 5 & 6 \\ 3 & x & 7 \end{bmatrix}$  is a symmetric matrix, find the value of  $x$ .
16.  $A = \begin{bmatrix} \cos \alpha & \sin \alpha \\ -\sin \alpha & \cos \alpha \end{bmatrix}$  then show that  $AA^T = I$ .
17. If  $A = \begin{bmatrix} 1 & 4 & 7 \\ 2 & 5 & 8 \end{bmatrix}$  then verify that  $(A+B)^T = A^T + B^T$ .
18. If  $A = \begin{bmatrix} 1 & 5 & 3 \\ 2 & 4 & 0 \\ 3 & -1 & -5 \end{bmatrix}$ ,  $B = \begin{bmatrix} 2 & -1 & 0 \\ 0 & -2 & 5 \\ 1 & 2 & 0 \end{bmatrix}$  then find  $BA - 4B^T$ .
19. If  $A = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$ ,  $B = \begin{bmatrix} 0 & 4 \\ -1 & 2 \end{bmatrix}$  then find  $BA^T$ .
20. If  $A = \begin{bmatrix} 0 & 4 \\ -1 & 2 \end{bmatrix}$  then find  $AA^T$ .

### ESSAY TYPE QUESTIONS

Find the Determinants of the following Matrices.

1.  $A = \begin{bmatrix} 2 & 1 \\ 1 & -5 \end{bmatrix}$
2.  $\begin{bmatrix} i & 0 \\ 0 & -i \end{bmatrix}$
3.  $\begin{bmatrix} 1 & -1 \\ -3 & 1 \end{bmatrix}$

$$4. \begin{bmatrix} 2 & -1 & 4 \\ 0 & -2 & 5 \\ -3 & 1 & 3 \end{bmatrix}$$

$$5. \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$$

$$6. \begin{bmatrix} 2 & -1 & 4 \\ 4 & -3 & 1 \\ 1 & 2 & 1 \end{bmatrix}$$

$$7. \begin{bmatrix} 1 & 4 & 2 \\ 2 & -1 & 4 \\ -3 & 7 & 6 \end{bmatrix}$$

$$8. \begin{bmatrix} 1 & 0 & -2 \\ 3 & -1 & 2 \\ 4 & 5 & 6 \end{bmatrix}$$

$$9. \begin{bmatrix} 1^2 & 2^2 & 3^3 \\ 2^2 & 3^2 & 4^2 \\ 3^2 & 4^2 & 5^2 \end{bmatrix}$$

$$10. \begin{bmatrix} a & b & c \\ b & c & a \\ c & a & b \end{bmatrix}$$

$$11. \begin{bmatrix} a & h & g \\ h & b & f \\ g & f & c \end{bmatrix}$$

$$12. \begin{bmatrix} 1 & w & w^2 \\ w & w^2 & 1 \\ w^2 & 1 & w \end{bmatrix} \text{ where } 1, w, w^2 \text{ are cube roots of unity.}$$

$$13. \text{ Find } x \text{ of } \begin{vmatrix} 1 & 0 & 0 \\ 2 & 3 & 4 \\ 5 & -6 & x \end{vmatrix} = 45.$$

14. Find  $\begin{vmatrix} 1 & -1 & 2 \\ 3 & 0 & 4 \\ -4 & -2 & 5 \end{vmatrix}$

15. P.T.  $\begin{vmatrix} a-b & b-c & c-a \\ b-c & c-a & a-b \\ c-a & a-b & b-c \end{vmatrix} = 0.$

16. P.T.  $\begin{vmatrix} b+c & c+a & a+b \\ c+a & a+b & b+c \\ a+b & b+c & c+a \end{vmatrix} = 2 \begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$

17. P.T.  $\begin{vmatrix} b+c & c+a & a+b \\ a+b & b+c & c+a \\ a & b & c \end{vmatrix} = a^3 + b^3 + c^3 - 3abc.$

18. P.T.  $\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix} = (a+b+c)^3$

19. P.T.  $\begin{vmatrix} a+b+2c & a & b \\ c & b+c+2a & b \\ c & a & c+a+2b \end{vmatrix} = 2(a+b+c)^3$

20.  $\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} = (a-b)(b-c)(c-a)$

21. P.T.  $\begin{vmatrix} 1 & a^2 & a^3 \\ 1 & b^2 & b^3 \\ 1 & c^2 & c^3 \end{vmatrix} = (a-b)(b-c)(c-a)(ab+bc+ca)$

22. Show that  $\begin{vmatrix} a & b & c \\ a^2 & b^2 & c^2 \\ a^3 & b^3 & c^3 \end{vmatrix} = abc(a-b)(b-c)(c-a).$

23. Show that  $\begin{vmatrix} 1 & a & a^2 - bc \\ 1 & b & b^2 - ca \\ 1 & c & c^2 - ab \end{vmatrix} = 0$

24. Show that 
$$\begin{vmatrix} ax & by & cz \\ x^2 & y^2 & z^2 \\ 1 & 1 & 1 \end{vmatrix} = \begin{vmatrix} a & b & c \\ x & y & z \\ yz & zx & xy \end{vmatrix}.$$

Without expanding the matrix.

**Solve the following problems.**

1. If  $A = \begin{bmatrix} \cos \alpha & -\sin \alpha \\ \sin \alpha & \cos \alpha \end{bmatrix}$  then find  $A^{-1}$ .

2. If  $A = \begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}$  then find  $\text{adj}(A)$ .

3. If  $A = \begin{bmatrix} -1 & -2 & -2 \\ 2 & 1 & -2 \\ 2 & -2 & 1 \end{bmatrix}$  then show that  $\text{adj} A = 3A^T$

4. If  $A = \begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$  then find  $A^3$  and  $A^{-1}$

5. If  $A = \begin{bmatrix} 1 & -2 & 3 \\ 0 & -1 & 4 \\ -2 & 2 & 1 \end{bmatrix}$  find  $(A^T)^{-1}$ .

**Solve the following system of equation using matrix invariant.**

1.  $x - y + 3z = 5$ ,  $4x + 2y - z = 0$ ,  $-x + 3y + z = 5$ .

2.  $2x - y + 3z = 8$ ,  $-x + 2y + z = 4$ ,  $3x + y - 4z = 0$ .

3.  $3x + 4y + 5z = 18$ ,  $2x - y + 8z = 13$ ,  $5x - 2y + 7z = 20$ .

**Solve the following system of equation using Cramer's Rule.**

1.  $x - y + 3z = 5$ ,  $4x + 2y - z = 0$ ,  $-x + 3y + z = 5$ .

2.  $2x - y + 3z = 9$ ,  $x + y + z = 6$ ,  $x - y + z = 2$ .

3.  $2x - y + 3z = 8$ ,  $-x + 2y + z = 4$ ,  $3x + y - 4z = 0$ .

## 6. TRIGONOMETRIC RATIOS AND FUNCTIONS

1. Find the value of  $\cos 225^\circ - \sin 225^\circ + \tan 495^\circ - \cot 495^\circ$ .
2. Find the value of  $\sin^2 \frac{\pi}{10} + \sin^2 \frac{4\pi}{10} + \sin^2 \frac{6\pi}{10} + \sin^2 \frac{9\pi}{10}$ .
3. Find the value of  $\cos^2 45^\circ + \cos^2 135^\circ + \cos^2 225^\circ + \cos^2 315^\circ$ .
4. Find the value of  $\sin^2 \frac{2\pi}{3} + \cos^2 \frac{5\pi}{6} - \tan^2 \frac{3\pi}{4}$ .
5. If  $\tan 20^\circ = p$  then prove that  $\frac{\tan 610^\circ + \tan 700^\circ}{\tan 560^\circ - \tan 470^\circ} = \frac{1-p^2}{1+p^2}$ .
6. Show that  $\cot \frac{\pi}{20} \cot \frac{3\pi}{20} \cot \frac{5\pi}{20} \cot \frac{7\pi}{20} \cot \frac{9\pi}{20} = 1$ .
7. If  $\tan 20^\circ = \lambda$  then prove that  $\frac{\tan 160^\circ - \tan 110^\circ}{1 + \tan 160^\circ \tan 110^\circ} = \frac{1-\lambda^2}{2\lambda}$ .
8. Prove that  $(\sin \theta + \cos \theta)^2 + (\cos \theta + \sec \theta)^2 - (\tan^2 \theta + \cot^2 \theta) = 7$ .
9. Prove that  $\frac{(1 + \sin \theta - \cos \theta)^2}{(1 + \sin \theta + \cos \theta)^2} = \frac{1 - \cos \theta}{1 + \cos \theta}$ .
10. If  $\frac{2 \sin \theta}{1 + \cos \theta + \sin \theta} = x$  then prove that  $\frac{1 - \cos \theta + \sin \theta}{1 + \sin \theta} = x$ .
11. Show that  $\cos^4 \alpha + 2 \cos^2 \alpha \left(1 - \frac{1}{\sec^2 \alpha}\right) = 1 - \sin^4 \alpha$ .
12. Prove that  $2(\sin^6 \theta + \cos^6 \theta) - 3(\sin^4 \theta + \cos^4 \theta) + 1 = 0$
13. Prove that  $(\tan \theta + \cot \theta)^2 = \sec^2 \theta + \operatorname{cosec}^2 \theta = \sec^2 \theta \operatorname{cosec}^2 \theta$ .
14. If  $\tan^2 \theta = 1 - e^2$  then show that  $\sec \theta + \tan^3 \theta \operatorname{cosec} \theta = (2 - e^2)^{3/2}$
15. Prove that  $3(\sin x - \cos x)^4 + 6(\sin x + \cos x)^2 + 4(\sin^6 x + \cos^6 x) = 13$ .
16. Prove that  $\frac{\tan \theta + \sec \theta - 1}{\tan \theta - \sec \theta + 1} = \frac{1 + \sin \theta}{\cos \theta}$ .
17. If  $3 \sin \theta + 4 \cos \theta = 5$  then find the value of  $4 \sin \theta - 3 \cos \theta$ .
18. If  $3 \sin A + 5 \cos A = 5$  then show that  $5 \sin A - 3 \cos A = \pm 3$ .
19. If  $a \cos \theta + b \sin \theta = C$  then show that  $a \sin \theta + b \cos \theta = \pm \sqrt{a^2 + b^2 - c^2}$ .
20. Of  $\cos \theta + \sin \theta = \sqrt{2} \cos \theta$ , then prove that  $\cos \theta - \sin \theta = \sqrt{2} \sin \theta$ .

21. If  $x = a \cos^3 \theta$   $y = b \sin^3 \theta$  then eliminate  $\theta$ .
22. Prove that  $\sin 780^\circ \sin 480^\circ + \cos 240^\circ \cos 300^\circ = \frac{1}{2}$ .
23. Find the value of  $\sin 330^\circ \cdot \cos 120^\circ + \cos 210^\circ \sin 300^\circ$ .

### COMPOUND ANGLES

#### I.

1. Find the value of  $\sin 75^\circ$ ,  $\cos 75^\circ$ ,  $\tan 75^\circ$ .
2. Prove that  $\cos 100^\circ \cos 40^\circ + \sin 100^\circ \sin 40^\circ = \frac{1}{2}$ .
3. Prove that  $\tan 75^\circ + \cot 75^\circ = 4$ .
4. Show that  $\cos 100^\circ \cos 40^\circ + \sin 100^\circ \sin 40^\circ = \frac{1}{2}$ .
5. Show that  $\cos 42^\circ + \cos 78^\circ + \cos 162^\circ = 0$ .
6. If  $\sin(\theta + \alpha) = \cos(\theta + \alpha)$  then find  $\tan \theta$  in term of  $\tan \alpha$ .
7. Find the value of  $\sin^2 82 \frac{1}{2}^\circ - \sin^2 22 \frac{1}{2}^\circ$ .
8. Find the value of  $\cos^2 112 \frac{1}{2}^\circ - \sin^2 52 \frac{1}{2}^\circ$ .
9. Find the value of  $\tan 20^\circ + \tan 40^\circ + \sqrt{3} \tan 20^\circ \tan 40^\circ$ .
10. Find the value of  $\tan 56^\circ - \tan 11^\circ - \tan 56^\circ \tan 11^\circ$ .

#### II.

1. If  $\sin \alpha = \frac{1}{\sqrt{10}}$ ,  $\sin \beta = \frac{1}{\sqrt{5}}$  and  $\alpha, \beta$  are acute then show that  $\alpha + \beta = \frac{\lambda}{4}$ .
2. If  $\sin(A + B) = \frac{24}{25}$   $\tan A = \frac{3}{4}$ ,  $A, B$  are acute then find the value of  $\cos B$ .
3. If  $A + B = 45^\circ$  then prove that  $(1 + \tan A)(1 + \tan B) = 2$ .
4. If  $A + B = 225^\circ$  then prove that  $\frac{\cot A \cot B}{(1 + \cot A)(1 + \cot B)} = 2$ .

5. If  $A - B = \frac{3\pi}{4}$  then show that  $(1 - \tan A)(1 + \tan B) = 2$ .
6. If  $A + B + C = \frac{\pi}{2}$  then prove that  $\cot A + \cot B + \cot C = \cot A \cot B \cot C$ .
7. If  $A + B + C = \frac{\pi}{2}$  then prove that  $\tan A \tan B + \tan B \tan C + \tan C \tan A = 1$ .
8. If  $A + B + C = 180^\circ$  then prove that  $\tan A + \tan B + \tan C = \tan A \tan B \tan C$ .
9. If  $A + B + C = 180^\circ$  then prove that  $\cot A \cot B + \cot B \cot C + \cot C \cot A = 1$ .
10. Find the expansion of (i)  $(A + B - C)$  (ii)  $\cos(A - B - C)$ .
11. If  $\sin(A + B) = \frac{24}{25}$  and  $\cos(A - B) = \frac{4}{5}$  where  $0 < A < B < \frac{\pi}{4}$  then find  $\tan 2A$ .

### MULTIPLE SUB MULTIPLE ANGLES

1. Prove that  $\frac{1 - \cos \theta + \sin \theta}{1 + \cos \theta + \sin \theta} = \tan \frac{\theta}{2}$ .
2. Prove that  $\frac{\sin 4\theta}{\sin \theta} = 8 \cos^3 \theta - 4 \cos \theta$ .
3. Prove that  $\cos^6 A + \sin^6 A = 1 - \frac{3}{4} \sin^2 2A$ .
4. Prove that  $\frac{\sin 3\theta}{1 + 2 \cos 2\theta} = \sin \theta$  and hence find the value of  $\sin 15^\circ$ .
5. Find the value of  $\sin^2 42^\circ - \sin^2 12^\circ$ .
6. If  $\tan \frac{A}{2} = \frac{5}{6}$  and  $\tan \frac{B}{2} = \frac{20}{37}$  then show that  $\tan \frac{C}{2} = \frac{2}{5}$ .
7. Prove that  $\frac{\sin 2\theta}{1 + \cos 2\theta} = \tan \theta$ .
8. Prove that  $\frac{1 - \cos 2\theta}{\sin 2\theta} = \tan \theta$  simplify  $\frac{(3 \cos \theta + \cos 3\theta)}{(3 \sin \theta - \sin 3\theta)}$ .
9. Prove that  $\frac{\cos 3A + \sin 3A}{\cos A - \sin A} = 1 + \sin 2A$ .
10. If  $\frac{\sin \alpha}{a} = \frac{\cos \alpha}{b}$  then prove that  $a \sin 2\alpha + b \cos 2\alpha = b$ .
11. Prove that  $\frac{1}{\sin 10^\circ} - \frac{\sqrt{3}}{\cos 10^\circ} = 4$ .

12. Prove that  $\frac{\sin 2A}{1 - \cos 2A} \cdot \frac{1 - \cos A}{\cos A} = \tan \frac{A}{2}$ .
13. Prove that  $\frac{\cos^3 \theta - \cos 3\theta}{\cos \theta} + \frac{\sin^3 \theta + \sin 3\theta}{\sin \theta} = 3$
14. Prove that  $\sin A(\sin(60^\circ + A)\sin(60^\circ - A)) = \frac{1}{4} \sin 3A$ .
15. Prove that  $\cos A \cos(60^\circ + A) \cos(60^\circ - A) = \frac{1}{4} \cos 3A$
16. Prove that  $\tan A \tan(60^\circ + A) \tan(60^\circ - A) = \tan 3A$ .
17. Prove that  $\left(1 + \cos \frac{\pi}{10}\right) \left(1 + \cos \frac{3\pi}{10}\right) \left(1 + \cos \frac{7\pi}{10}\right) \left(\frac{1 + \cos 9\pi}{10}\right) = \frac{1}{6}$ .
18. Prove that  $\cos^2 \frac{\pi}{10} + \cos^2 \frac{2\pi}{5} + \cos^2 \frac{3\pi}{5} + \cos^2 \frac{9\pi}{10} = 2$ .
19. Prove that  $\cos \frac{2\pi}{7} \cdot \cos \frac{4\pi}{7} \cdot \cos \frac{6\pi}{7} = \frac{1}{8}$ .
20. Prove that  $\cos \frac{\pi}{11} \cdot \cos \frac{2\pi}{11} \cdot \cos \frac{3\pi}{11} \cdot \cos \frac{4\pi}{11} \cdot \cos \frac{5\pi}{11} = \frac{1}{32}$ .

## TRANSFORMATIONS

### I.

1. Prove that  $\sin 34^\circ + \cos 64^\circ - \cos 4^\circ = 0$ .
2. Prove that  $\cos 55^\circ + \cos 65^\circ + \cos 175^\circ = 0$ .
3. Prove that  $\cos 35^\circ + \cos 85^\circ + \cos 155^\circ = 0$ .
4. Prove that  $\frac{\sin 70^\circ - \cos 40^\circ}{\cos 50^\circ - \sin 20^\circ} = \frac{1}{\sqrt{3}}$ .
5. Prove that  $4(\sin 24^\circ + \cos 6^\circ) = \sqrt{15} + \sqrt{13}$ .
6. Prove that  $\cos^2 76^\circ + \cos^2 16^\circ - \cos 76^\circ \cos 16^\circ = \frac{3}{4}$ .
7. Prove that  $\sin 10^\circ + \sin 20^\circ + \sin 40^\circ + \sin 50^\circ = \sin 70^\circ + \sin 80^\circ$ .
8. Prove that  $\sin 50^\circ - \sin 70^\circ + \sin 10^\circ = 0$ .
9. Prove that  $\cos 48^\circ \cos 12^\circ = \frac{3 + \sqrt{5}}{8}$ .
10. Prove that  $\sin 78^\circ + \cos 132^\circ = \frac{\sqrt{5} - 1}{4}$ .



## II.

1. Prove that  $\cos^2 \theta + \cos^2 \left( \frac{2\pi}{3} + \theta \right) + \cos^2 \left( \frac{2\pi}{3} - \theta \right) = \frac{3}{2}$ .
2. Prove that  $\sin^2(\alpha - 45^\circ) + \sin^2(\alpha + 15^\circ) - \sin^2(\alpha - 15^\circ) = \frac{1}{2}$ .
3. Prove that  $\frac{\sin(n+1)\alpha - \sin(n-1)\alpha}{\cos(n+1)\alpha + 2\cos n\alpha + \cos(n-1)\alpha} = \tan \frac{\alpha}{2}$ .
4. If  $x + y = \frac{2\pi}{3}$  and  $\sin x + \sin y = \frac{3}{2}$  then find  $x$  and  $y$ .
5. If  $\cos x + \cos y = \frac{4}{5}$ ,  $\cos x - \cos y = \frac{2}{7}$  then show that  $14 \tan \frac{x-y}{2} + 5 \cot \frac{x+y}{2} = 0$ .
6. If  $\frac{\sin(\alpha + \beta)}{\sin(\alpha - \beta)} = \frac{a+b}{a-b}$  then prove that  $a \tan \beta = b \tan \alpha$ .
7. If  $m \sin B = n \sin(2A + B)$  then show that  $(m+n) \tan A = (m-n) \tan(A+B)$ .
8. If  $\tan(A+B) = \lambda \tan(A-B)$  then show that  $(\lambda+1) \sin 2B = (\lambda-1) \sin 2A$ .
9. If  $A+B+C = 180^\circ$  then prove that  $\sin 2A + \sin 2B + \sin 2C = 4 \sin A \sin B \sin C$ .
10. If  $A+B+C = 180^\circ$  then prove that  $\sin 2A - \sin 2B + \sin 2C = 4 \cos A \sin B \cos C$ .
11. If  $A+B+C = 180^\circ$  then prove that  $\cos 2A + \cos 2B + \cos 2C = -1 - 4 \cos A \cos B \cos C$ .
12. If  $A+B+C = 90^\circ$  then prove that  $\cos 2A + \cos 2B + \cos 2C = 1 + 4 \sin A \sin B \sin C$ .
13. In  $\Delta ABC$  prove that  $\sin^2 \frac{A}{2} + \sin^2 \frac{B}{2} - \sin^2 \frac{C}{2} = 1 - 2 \cos \frac{A}{2} \cos \frac{B}{2} \sin \frac{C}{2}$ .
14. If  $A+B+C = 0^\circ$  then prove that  $\sin 2A + \sin 2B + \sin 2C = -4 \sin A \sin B \sin C$ .
15. If  $A+B+C = 270^\circ$  then prove that  $\cos 2A + \cos 2B + \cos 2C = 1 - 4 \sin A \sin B \sin C$ .
16. If  $A+B+C = 2S$  then prove that  $\cos(S-A) + \cos(S-B) + \cos(S-C) = 4 \cos \frac{A}{2} \cos \frac{B}{2} \cos \frac{C}{2}$ .

## 7. TRIGONOMETRIC EQUATION

1. Solve  $\tan \theta + 3 \cot \theta = 5 \sec \theta$ .
2. Solve  $2 \cos^2 \theta - \sqrt{3} \sin \theta + 1 = 0$ .
3. Solve  $4 \cos^2 \theta + \sqrt{3} = 2(\sqrt{3} + 1) \cos \theta$ .
4. Solve  $7 \sin^2 \theta + 3 \cos^2 \theta = 4$ .

5. Solve  $\cot^2 \theta - (1 + \sqrt{3}) \cot \theta + \sqrt{3} = 0$ .
6. Solve  $1 + \sin^2 \theta = 3 \sin \theta \cos \theta$ .
7. Solve  $\sin 5\theta + \sin \theta = \sin 3\theta$ .
8. Solve  $\cos 8\theta + \cos 2\theta = \cos 5\theta$ .
9. Solve  $\cos \theta \cdot \cos 2\theta \cdot \cos 3\theta = \frac{1}{4}$ .
10. Solve  $\sqrt{3} \cos \theta + \sin \theta = \sqrt{2}$ .
11. Solve  $\sqrt{3} \sin \theta - \cos \theta = \sqrt{2}$ .
12. Solve  $\tan \theta + \sec \theta = \sqrt{3}$ .
13. Solve  $1 + \cos x + \cos^2 x + \dots + \infty$
14. Solve  $4 \sin x \cdot \sin 2x \cdot \sin 4x = \sin 3x$ .
15. Solve  $3 \operatorname{cosec} \theta = 4 \sin \theta$ .
16. If  $a \cos 2\theta + b \sin 2\theta = C$  then prove that  $\tan \theta_1 + \tan \theta_2 = \frac{2b}{c+a}$ ,  $\tan \theta_1 \cdot \tan \theta_2 = \frac{c-a}{c+a}$ .
17. Solve  $\sin^{-2} \theta - \cos \theta = \frac{1}{4}$ .

### 18. HYPERBOLIC FUNCTIONS

1. Prove that  $\sinh(\alpha + \beta) = \sinh \alpha \cosh \beta + \cosh \alpha \sinh \beta$ .
2. Prove that  $\cosh(\alpha + \beta) = \cosh \alpha \cosh \beta + \sinh \alpha \sinh \beta$ .
3. Prove that  $\tanh(\alpha + \beta) = \frac{\tanh \alpha + \tanh \beta}{1 + \tanh \alpha \tanh \beta}$ .
4. Prove that  $\sinh(\alpha - \beta) = \sinh \alpha \cosh \beta - \cosh \alpha \sinh \beta$ .
5. Prove that  $\cosh(\alpha - \beta) = \cosh \alpha \cosh \beta - \sinh \alpha \sinh \beta$ .
6. Prove that  $\sinh 2x = 2 \sinh x \cosh x$ .
7. Prove that  $\cosh 2x = \cosh^2 x + \sinh^2 x$ .
8. Prove that  $\tanh 2x = \frac{2 \tanh x}{1 + \tanh^2 x}$ .
9. Prove that  $\sinh 3x = 3 \sinh x + 4 \sinh^3 x$ .
10. Prove that  $\cosh 3x = 4 \cosh^3 x - 3 \cosh x$ .

11. Prove that  $\tanh 3x = \frac{3 \tanh x + \tanh^3 x}{1 + 3 \tanh^2 x}$ .
12. Prove that  $\frac{\tanh x}{\sec hx - 1} + \frac{\tanh x}{\sec hx + 1} = -2 \operatorname{cosec} hx$ .
13. Prove that  $[\cosh x + \sinh x]^4 = \cosh nx + \sinh nx$ .
14. If  $\cosh x = \frac{5}{2}$  then prove that  $\cosh 2x = \frac{23}{2}$ ,  $\sinh 2x = \frac{5\sqrt{21}}{2}$ .
15. If  $u = \log_e \left( \tan \left( \frac{\pi}{4} + \frac{\theta}{2} \right) \right)$  then prove that  $\cosh u = \sec \theta$ .
16. If  $\sin hx = \frac{3}{4}$  then find  $\cosh 2x$  and  $\sinh 2x$ .

#### 4.5. VECTOR ALGEBRA

- Let  $\bar{a} = \bar{i} + 2\bar{j} + 3\bar{k}$  and  $\bar{b} = 3\bar{i} + \bar{j}$  find the unit vector in the direction of  $\bar{a} + \bar{b}$ .
- If the vectors  $-3\bar{i} + 4\bar{j} + \lambda\bar{k}$  and  $\mu\bar{i} + 8\bar{j} + 6\bar{k}$  are collinear vectors then find  $\lambda$  and  $\mu$ .
- If the points whose position vectors are  $3\bar{i} - 2\bar{j} - \bar{k}$ ,  $2\bar{i} + 3\bar{j} - 4\bar{k}$ ,  $-\bar{i} + \bar{j} + 2\bar{k}$  and  $4\bar{i} + 5\bar{j} + \lambda\bar{k}$  are coplanar then show that  $\lambda = \frac{-146}{17}$ .
- If  $OA = \bar{i} + \bar{j} + \bar{k}$ ,  $AB = 3\bar{i} - 2\bar{j} + \bar{k}$ ,  $BC = \bar{i} + 2\bar{j} - 2\bar{k}$  and  $CD = 2\bar{i} + \bar{j} + 3\bar{k}$  then find the vector OD.
- Let  $a = 2\bar{i} + 4\bar{j} - 5\bar{k}$ ,  $b = \bar{i} + \bar{j} + \bar{k}$  and  $c = \bar{j} + 2\bar{k}$  find the unit vector in the opposite direction of  $a + b + c$ .
- $AOBC$  is a parallelogram if  $\overline{OA} = \bar{a}$  and  $\overline{OC} = \bar{c}$  find the vector equation of the side  $BC$ .
- Find the vector equation of the plane passing through the points  $\bar{i} - 2\bar{j} + 5\bar{k}$ ,  $-5\bar{j} - \bar{k}$  and  $-3\bar{i} + 5\bar{j}$ .
- If  $\bar{a} = 6\bar{i} + 2\bar{j} + 3\bar{k}$  and  $\bar{b} = 2\bar{i} - \bar{j} + 6\bar{k}$  then find the angle between the vectors  $\bar{a}$  and  $\bar{b}$ .
- If  $|a| = 11$ ,  $|b| = 23$  and  $|a - b| = 30$  then find the angle between the vectors  $a$  and  $b$  also find  $|a + b|$ .
- If the vectors  $\lambda\bar{i} - 3\bar{j} + 5\bar{k}$  and  $2\lambda\bar{i} - \lambda\bar{j} - \bar{k}$  are perpendicular to each other find  $\lambda$ .
- $a = 2\bar{i} - \bar{j} + \bar{k}$ ,  $b = \bar{i} - 3\bar{j} - 5\bar{k}$  find the vector  $c$  such that  $\bar{a}, \bar{b}$  and  $c$  form the sides of a triangle.
- If  $|a| = 2$ ,  $|b| = 3$  and  $|c| = 4$  and each of  $\bar{a}, \bar{b}, \bar{c}$  is perpendicular to the sum of the other two vectors then find the magnitude of  $\bar{a} + \bar{b} + \bar{c}$ .

13. Find the area of the parallelogram for which the vector  $\vec{a} = 2\vec{i} - 3\vec{j}$  and  $\vec{b} = 3\vec{i} - \vec{k}$  are adjacent sides.
14. If  $4\vec{i} + \frac{2p}{3}\vec{j} + p\vec{k}$  is parallel to the vector  $\vec{i} + 2\vec{j} + 3\vec{k}$  find the value of  $p$ .
15. If  $|a| = 13, |b| = 5$  and  $a \cdot b = 60$  then find  $|\vec{a} \times \vec{b}|$ .
16. If  $a = 7\vec{i} - 2\vec{j} + 3\vec{k}$ ,  $b = 2\vec{i} + 8\vec{k}$  and  $c = \vec{i} + \vec{j} + \vec{k}$  then compute  $\vec{a} \times \vec{b}$ ,  $\vec{a} \times \vec{c}$  and  $\vec{a} \times (\vec{b} + \vec{c})$ .  
Verify whether the cross product is distributive over vector addition.
17. If  $a = 3\vec{i} - \vec{j} + 2\vec{k}$ ,  $b = -\vec{i} + 3\vec{j} + 2\vec{k}$ ,  $c = 4\vec{i} + 5\vec{j} - 2\vec{k}$  and  $d = \vec{i} + 3\vec{j} + 5\vec{k}$  then compute the following.
- $(\vec{a} \times \vec{b}) \times (\vec{c} \times \vec{d})$
  - $(\vec{a} \times \vec{b}) \cdot \vec{c} - (\vec{a} \times \vec{d}) \cdot \vec{b}$
18. If the vectors  $a = 2\vec{i} - \vec{j} + \vec{k}$ ,  $b = \vec{i} + 2\vec{j} - 3\vec{k}$  and  $c = 3\vec{i} + p\vec{j} + 5\vec{k}$  are coplanar then find  $p$ .
19. Find the equation of the plane passing through the points  $A(2, 3, -1)$ ,  $B(4, 5, 2)$  and  $C(3, 6, 5)$ .
20. Find the shortest distance between the skew lines  $r = (6\vec{i} + 2\vec{j} + 2\vec{k}) + t(\vec{i} - 2\vec{j} + 2\vec{k})$  and  $r = (-4 - \vec{k}) + s(3\vec{i} - 2\vec{j} - 2\vec{k})$ .
21. Simplify the following:
- $(\vec{i} - 2\vec{j} + 3\vec{k}) \times (2\vec{i} + \vec{j} - \vec{k}) \cdot (\vec{j} + \vec{k})$
  - $(2\vec{i} - 3\vec{j} + \vec{k}) \cdot (\vec{i} - \vec{j} + 2\vec{k}) \times (2\vec{i} + \vec{j} + \vec{k})$
22. Find  $\lambda$  in order that the four points  $A(3, 2, 1)$ ,  $B(4, \lambda, 5)$ ,  $C(4, 2, -2)$  and  $D(6, 5, -1)$  be coplanar.
23. Find the volume of the tetrahedron having the edges  $\vec{i} + \vec{j} + \vec{k}$ ,  $\vec{i} - \vec{j}$  and  $\vec{i} + 2\vec{j} + \vec{k}$ .
24. Compute  $\begin{vmatrix} \vec{i} - \vec{j} & \vec{i} - \vec{k} & \vec{k} - \vec{i} \end{vmatrix}$ .
25. If  $\vec{a} = (1, -2, 1)$ ,  $\vec{b} = (2, 1, 1)$  and  $\vec{c} = (1, 2, -1)$  then find  $|\vec{a} \times (\vec{b} \times \vec{i})|$  and  $|(\vec{a} \times \vec{b}) \times \vec{c}|$ .
26. If  $\vec{a} = 2\vec{i} + 2\vec{j} - 3\vec{k}$ ,  $\vec{b} = 3\vec{i} - \vec{j} + 2\vec{k}$  then find the angle between  $(2\vec{a} + \vec{b})$  and  $(\vec{a} + 2\vec{b})$ .
27. Simplify the following:
- $(\vec{i} - 2\vec{j} + 3\vec{k}) \times (2\vec{i} + \vec{j} - \vec{k}) \times (\vec{j} + \vec{k})$
  - $(2\vec{i} - 3\vec{j} + \vec{k}) \cdot (\vec{i} - \vec{j} + 2\vec{k}) \times (2\vec{i} + \vec{j} + \vec{k})$
28. If  $\vec{a}, \vec{b}, \vec{c}$  are non co-planer vectors, then find the value of  $\frac{(a + 2b - c)[(a - b) \times (a - b - c)]}{[a \ b \ c]}$ .

## LIMITS AND CONTINUITY

Complete the following limits.

1.  $\lim_{x \rightarrow 3} \frac{x^2 - 8x + 15}{x^2 - 9}$

2.  $\lim_{x \rightarrow 0^+} \frac{|x|}{x}, \lim_{x \rightarrow 0^-} \frac{|x|}{x}$

3.  $\lim_{x \rightarrow 2^+} ([x] + x), \lim_{x \rightarrow 2^-} ([x] + x)$

4.  $\lim_{x \rightarrow 0} \frac{\tan x}{x} - 1$

5.  $\lim_{x \rightarrow 0} \frac{\sqrt{1+x} - 1}{x}$

6.  $\lim_{x \rightarrow 0} \left[ \frac{e^x - 1}{\sqrt{1+x} - 1} \right]$

7.  $\lim_{x \rightarrow 0} \frac{a^x - 1}{b^x - 1} (a > 0, b > 0, b \neq 1)$

8.  $\lim_{x \rightarrow 0} \frac{\sin ax}{\sin bx}$ .

9.  $\lim_{x \rightarrow 0} \frac{e^{3x} - 1}{x}$

10.  $\lim_{x \rightarrow 0} \frac{e^x \sin x - 1}{x}$

11.  $\lim_{x \rightarrow 0} \frac{e^{3+x} - e^3}{x}$

12.  $\lim_{x \rightarrow 0} \frac{e^{\sin x} - 1}{x}$

13.  $\lim_{x \rightarrow 0} \frac{3^x - 1}{\sqrt{1+x} - 1}$ .

14.  $\lim_{x \rightarrow a} \frac{\sin(x-a) \tan^2(x-a)}{(x^2 - a^2)^2}$

15.  $\lim_{x \rightarrow 0} \frac{\cos ax - \cos bx}{x^2}$

$$16. \lim_{x \rightarrow 0} \frac{x \sin a - a \sin x}{x - a}.$$

$$17. \lim_{x \rightarrow 0} \frac{\sqrt[3]{1+x} - \sqrt[3]{1-x}}{x}$$

$$18. \lim_{x \rightarrow 0} \frac{1 - \cos 2mx}{\sin^2 nx}$$

$$19. \lim_{x \rightarrow 0} \frac{x^2 + 5x + 2}{2x^2 - 5x + 1}$$

$$20. \lim_{x \rightarrow 0} \frac{8|x| + 3x}{3|x| - 2x}.$$

$$21. \lim_{x \rightarrow \infty} (\sqrt{x+1} - x)$$

$$22. \lim_{x \rightarrow \infty} (\sqrt{x^2+1} - x)$$

$$23. \text{ Evaluate } \lim_{x \rightarrow 0} \left( \frac{\sin(a+bx) - \sin(a-bx)}{x} \right)$$

$$24. \text{ Evaluate } \lim_{x \rightarrow 2} \frac{2x^2 - 7x - 4}{2x - 1}.$$

$$25. \lim_{x \rightarrow \infty} \frac{2x^2 - x + 3}{x^2 - 2x + 5}$$

$$26. \lim_{x \rightarrow \infty} \frac{11x^3 - 3x + 4}{11x^3 - 5x^2 - 7}$$

$$27. \lim_{x \rightarrow \infty} \frac{3x^2 - 4x + 5}{2x^2 + 3x - 7}$$

### CONTINUITY

$$1. \text{ Is } f \text{ defined by } f(x) = \begin{cases} \frac{\sin 2x}{x}, & \text{if } x \neq 0 \\ 1, & \text{if } x = 0 \end{cases} \text{ Continuous at 0.}$$

$$2. \text{ If } f, \text{ given by } f(x) = \begin{cases} k^2x - k, & \text{if } x \geq 0 \\ 2, & \text{if } x < 1 \end{cases} \text{ is a Continuous function on } \mathbb{R} \text{ then find the value of } K.$$

3. Show that  $f(x) = \begin{cases} \frac{\cos ax - \cos bx}{x^2}, & \text{if } x \neq 0 \\ \frac{1}{2}(b^2 - a^2), & \text{if } x = 0 \end{cases}$  where  $a$  and  $b$  are real. Constants is

continuous at '0'.

4. Find real constants  $a, b$  so that the function  $f$  given by

$$f(x) = \begin{cases} \sin x ; & \text{if } x \leq 0 \\ x^2 + a ; & \text{if } 0 < x < 1 \\ bx + 3 ; & \text{if } 1 \leq x \leq 3 \\ -3 ; & \text{if } x > 3 \end{cases}$$

Is continuous on  $\mathbb{R}$ .

## 10. DIFFERENTIATION

**Find the derivatives of the following functions.**

1.  $\sin(\log x)(x > 0)$ .

2.  $(x^3 + 6x^2 + 12x - 13)^{100}$

3.  $\sin^{-1}(\sqrt{x})$

4.  $\log(\cosh 2x)$

5.  $(\cot^{-1} x^3)^2$

6.  $\log(\sec x + \tan x)$

7.  $e^{\sin^{-1} x}$

8.  $\sin^{-1}(3x - 4x^3)$

9.  $\cos^{-1}(4x^3 - 3x)$

10.  $\tan^{-1}\left(\frac{2x}{1-x^2}\right)$

11.  $\tan^{-1}\left(\frac{a-x}{1+ax}\right)$

12. If  $y = \tan^{-1}\left(\frac{2x}{1-x^2}\right) + \tan^{-1}\left(\frac{3x-x^3}{1-3x^2}\right) - \tan^{-1}\left(\frac{4x-4x^3}{1-6x^2+x^4}\right)$  then show that  $\frac{dy}{dx} = \frac{1}{1+x^2}$

13. If  $y = \tan^{-1}\left(\frac{\sqrt{1+x^2} + \sqrt{1-x^2}}{\sqrt{1+x^2} - \sqrt{1-x^2}}\right)$  for  $0 < |x| < 1$  find  $\frac{dy}{dx}$ .

14. Find the derivative of  $\sin^{-1}\left(\frac{b+a\sin x}{a+b\sin x}\right)$  ( $a > 0, b > 0$ )
15. Find the derivative of  $\cos^{-1}\left(\frac{b+a\cos x}{a+b\cos x}\right)$  ( $a > 0, b > 0$ )
16. Find the derivative of  $\tan 2x$  from first principle.
17. Find the derivative of  $x\sin x$  from first principle.
18. Find the derivative of  $x^2 + 2$  from definition method.
19. Find  $\frac{d}{dx}\left[\frac{\cos x}{\cos x + \sin x}\right]$
20. Find the derivative of  $a^x$  using first principles.
21. Find the derivative of  $\cos 2x$  using first principles.

### 11. APPLICATIONS OF DIFFERENTIATION

1. If the increase in the side of a square is 2%. Then find the approximate percentage of increase in its area?
2. Find  $dy$  and  $\Delta y$  of  $y = f(x) = x^2 + x$  at  $x = 10$  when  $\Delta x = 0.1$ .
3. Find  $\Delta y$  and  $dy$  for the functions  $y = e^x + x$  when  $x = 5$  and  $\Delta x = 0.02$ .
4. Find the equations of the tangent and the normal to the curve  $y = 5x^4$  at the point (1,5).
5. Find the slope of the tangent to the curve  $y = x^3 - x + 1$  at the point whose  $x$  co-ordinate is 2.
6. Find the slope of the tangent to the curve  $y = 3x^4 - \Delta x$  at  $x = 4$ .
7. Find the lengths of sub tangent and sub normal at a point on the curve  $y = b \sin \frac{x}{a}$ .
8. Find the lengths of normal and subnormal of a point on the curve  $y = \frac{a}{2}\left(e^{\frac{x}{a}} + e^{-\frac{x}{a}}\right)$ .
9. Show that the curves  $y^2 = 4(x+1)$  and  $y^2 = 36(9-x)$  intersect orthogonally.
10. Show that the curves  $6x^2 - 5x + 2y = 0$  and  $4x^2 + 8y^2 = 3$  touch each other at  $\left(\frac{1}{2}, \frac{1}{2}\right)$ .
11. If the tangent at any point on the curve  $x^{2/3} + y^{2/3} = a^{2/3}$  intersects the coordinate axes in A and B then show that length AB is constant.



12. Show that the curves  $x^2 + y^2 = 2$  and  $3x^2 + y^2 = 4x$  have a common tangent at the point  $(1,1)$ .
13. Find the equations of tangent and normal to the curve  $y = x^3 + 4x^2$  at  $(-1,3)$ .
14. Show that the length of the subnormal at any point on the curve  $y^2 = 4ax$  is a constant.
15. Show that the length of the sub tangent at any point on the curve  $y^2 = 4ax$  is a constant.
16. A particle is moving in a straight line so that after  $t$  seconds its distance is from a fixed point on the line is given by  $s = f(t) = 8t + t^3$  find
  - (i) The velocity at time  $t = 2$  sec.
  - (ii) The initial velocity
  - (iii) Acceleration at  $t = 2$  sec .
17. A particle moving along a straight line has the relation  $s = t^3 + 2t + 3$  connecting the distance. 's' described by the. Particle in time  $t$ . Find the velocity and acceleration of the particle at  $t = 4$  seconds.
18. The distance – time formula for the motion of a particle along a straight line is  $s = t^3 - 9t^2 + 24t - 18$ . Find when and where the velocity is zero.
19. Find the equations of tangent and normal to the curve of  $y = x^4 - 6x^3 + 13x^2 - 10x + 5$  at  $(0,5)$ .

## I. LOCUS

### Short Answer Questions

1. Find the equation of Locus of a point P, if the distance of P from A(3, 0) is twice the distance of P from B(-3, 0).
2. Find the equation of a point which is at a distance from A(4, -3).
3. Find the equation of Locus of a point which equidistant from the points A(-3, 2) and B(0, 4).
4. Find the equation of Locus of a point P such that the distance of P from the origin is twice the distance of P from A(1,2)
5. Find the equation of Locus of a point P, the square of whose distance from the origin is 4 times its Y-coordinate.
6. Find the equation of Locus of a point P such that  $PA^2 + PB^2 = PC^2$ , where  $A = (a, 0)$ ,  $B = (-a, 0)$  and  $0 < |a| < |C|$ .

### Essay Type Questions

1. Find the equation of Locus P, if the line segment joining (2, 3) and (-1, 5) subtends a right angle at P.
2. Find the equation of the Locus of P, if  $A = (4, 0)$   $B = (-4, 0)$  and  $|PA - PB| = 4$ .
3. Find the equation of the Locus of P, if  $A = (2, 3)$   $B = (2, -3)$  and  $|PA + PB| = 8$ .
4. A (5, 3) and B(3, -2) are two fixed points. Find the equation of the Locus of P, so that the area of triangle is 9.
5. If the distance from P to the points (2, 3) and (2, -3) are in the ratio 2:3, then find the equation of the Locus of P.
6. A(1,2) B(2, -3) and C(-2, 3) are three points, a point P moves such that  $PA^2 + PB^2 = 2PC^2$ . Show that the equation of the Locus of P is  $7x - 7y + 4 = 0$ .

## II. TRANSFORMATION OF AXES

### Short Answer Questions

1. When the origin is shifted to (-2, 3) by transformation of axes, let us find the co-ordinates of (1, 2) w.r.t. new axes.

- When the origin is shifted to  $(2, 3)$  by translation of axes, the co-ordinates of a point P are changed as  $(4, -3)$ . Find the coordinates of P in the original system.
- Find the point to which the origin is to be shifted so that the point  $(3, 0)$  may change to  $(2, -3)$ .
- Find the point to which the origin is to be shifted so as to remove the first degree terms from the equation,  $4x^2 + 9y^2 - 8x + 36y + 4 = 0$ .
- When the axes are rotated through an angle  $30^\circ$ , find the new coordinates of  $(0, 5)$ ,  $(-2, 4)$  and  $(0, 0)$ .
- When the axes are rotated through an angle  $60^\circ$ , find the original co-ordinates of  $(3, 4)$ ,  $(-7, 2)$  and  $(2, 0)$ .
- Find the angle through which the axes are to be rotated so as to remove the  $xy$  term in the equation  $x^2 + 4xy - y^2 - 2x + 2y - 6 = 0$ .

### Essay Type Questions:

- When the origin is shifted to the point  $(2, 3)$ , the transformed equation of a curve is  $x^2 + 3xy - y^2 - 2y^2 + 17x - 7y - 11 = 0$ . Find the original equation of the curve.
- When the origin is shifted to  $(-1, 2)$  by the translation of axes, find the transformed equation to  $x^2 + y^2 + 2x - 4y + 1 = 0$ .
- When the axes are rotated through an angle  $45^\circ$ , find the original equation of the curve  $17x^2 - 16xy + 17y^2 = 225$ .
- When the axes are rotated through an angle  $\frac{\pi}{4}$ , find the transformed equation  $3x^2 + 10xy + 3y^2 = 9$ .

## III. STRAIGHT LINES

### Short Answer Questions

- Find the equation of straight line joining through the point  $(2, 3)$  and making non-zero intercept on the coordinate axes whose sum is zero.
- Find the value of  $x$  if the slope of the line passing through  $(2, 5)$  and  $(x, 3)$  is 2.
- Find the value of  $y$  if the line joining the points  $(3, y)$   $(2, 7)$  is parallel to the line joining the points  $(-1, 4)$   $(0, 6)$ .

4. Find the equation of straight line which makes an angle of  $\frac{\pi}{4}$ , with x-axis and passing through the points (0, 0).
5. Show that the points (-5, 1) (5, 5) (10, 7) are collinear.
6. Find the sum of the squares of the intercepts of the line  $4x - 3y = 12$  on the coordinate axes.
7. Find the equation of straight line which makes an angle of  $\alpha = 150^\circ$  with x-axis and passing through (1, 2).
8. Transform the straight line  $4x - 3y + 12 = 0$  into (a) slope – intercept form (b) intercept form (c) normal form.
9. Find the ratios in which (i) x-axis and (ii) y-axis divide the line segment AB joining A(2, -3) & B(3, -6).
10. Find the value of K if the lines  $2x - 3y + k = 0$ ,  $3x - 4y + 13 = 0$  and  $8x - 11y + 33 = 0$  are concurrent.
11. Find the angle between straight line  $y = 4 - 2x$ ;  $y = 3x + 7$ .
12. Find the length of perpendicular drawn from the point (-2, -3) to the straight line  $5x - 2y + 4 = 0$ .
13. Find the distance between parallel lines  $3x - 4y = 12$  and  $3x - 4y = 7$ .
14. Find the value of P if the straight lines  $3x + 7y - 1 = 0$  and  $7x - py + 3 = 0$  are mutually perpendicular.
15. Find the foot of the perpendicular drawn from (4, 1) upon the straight line  $3x - 4y + 12 = 0$ .
16. Find the image the point (1, 2) is the straight line  $3x + 4y - 1 = 0$ .
17. Find the foot of the perpendicular drawn from the point (3, 0) on to the line  $4x + 12y - 41 = 0$ .
18. If the straight lines  $ax + by + c = 0$ ,  $bx + cy + a = 0$ ,  $cx + ay + b = 0$  are concurrent, then prove that  $a^3 + b^3 + c^3 = 3abc$ .
19. Find the equation of the line which passes through (0, 0) and the point of intersection of the lines  $x + y + 1 = 0$  and  $2x - y + 5 = 0$ .

20. Show that the distance of the point  $(6, -2)$  from the line  $4x + 3y = 12$  is half the distance of the point  $(3, 4)$  from the line  $(4x - 3y = 12)$ .
21. Transform the equation of the line  $x + y + 2 = 0$  into  
(i) Slope – intercept form (ii) intercept form (iii) normal form.

## PAIR OF STRAIGHT LINES

### Essay Type Questions

1. Find the acute angle between the pair of lines represented  $x^2 - 7xy + 12y^2 = 0$ .
2. Find the centroid and area of a triangle formed by the lines  $2y^2 - xy - 6x^2 = 0$ ,  $x + y + 4 = 0$ .
3. Find the equation of pair of lines intersecting at  $(2, -1)$  and perpendicular to the pair of straight line  $6x^2 - 13xy - 5y^2 = 0$ .
4. Find the equation of pair of lines intersecting at  $(2, -1)$  and parallel to the pair  $6x^2 - 13xy - 5y^2 = 0$ .
5. Find the combined equation of pair of bisectors of the angles between the pair of straight lines represented by  $6x^2 - 11xy + 3y^2 = 0$ .
6. Show that the equation  $2x^2 - 13xy - 7y^2 + x + 23y - 6 = 0$  represents a pair of straight lines and also find the angle between and the co-ordinates of the point of intersection of lines.
7. Show that the equation  $8x^2 - 24xy + 18y^2 - 6x + 9y - 5 = 0$  represents a pair of parallel lines and find the distance between them.
8. Show that the lines joining the origin to the points of intersection of curve  $x^2 - xy + y^2 + 3x + 3y - 2 = 0$  and the straight line  $x - y - \sqrt{2} = 0$  are normally perpendicular.
9. Find the values of K. If the lines joining the origin to the points of intersection of the curve  $2x^2 - 2xy + 3y^2 + 2x - y - 1 = 0$  and the lines  $x + 2y = k$  are mutually perpendicular.
10. Find the angle between the lines joining the origin to the points of intersection of the curve  $7x^2 - 4xy + 8y^2 + 2x - 4y - 8 = 0$  with the straight line.  $3x - y = 2$ .
11. Find the condition for the lines joining the origin to the points of intersection of the circle  $x^2 + y^2 = a^2$  and the line  $lx + my = 1$  to coincide.

## THREE DIMENSIONAL COORDINATES

### Short Answer Questions

1. Find  $x$  if the distance between  $(5, -1, 7)$  and  $(x, 5, 1)$  is 9 units.
2. Show that the points  $(2, 3, 5)$ ,  $(-1, 5, -1)$  and  $(4, -3, 2)$  form a straight angled isosceles triangle.
3. Show that the points  $(1, 2, 3)$ ,  $(2, 3, 1)$  and  $(3, 1, 2)$  form an equilateral triangle.
4. Show the points  $(1, 2, 3)$ ,  $(7, 0, 1)$  and  $(-2, 3, 4)$  are collinear.
5. Find the coordinates of vertex  $C$  of  $\triangle ABC$ , if its centroid is origin and the vertices  $A$ ,  $B$  are  $(1, 1, 1)$  and  $(-2, 4, 1)$  respectively.
6. If  $(3, 2, -1)$ ,  $(4, 1, 1)$  and  $(6, 2, 5)$  are three vertices and  $(4, 2, 2)$  is a centroid of tetrahedron, find the fourth vertex.
7. Find the distance between the midpoint of line segment  $AB$  and the point  $(3, -1, 2)$  where  $A = (6, 3, -4)$  and  $B = (-2, -1, 2)$ .
8. The three consecutive vertices of a parallelogram are given as  $(2, 4, -1)$ ,  $(3, 6, -1)$ ,  $(4, 5, 1)$ . Find the fourth vertex.

## DIRECTION COSINES AND DIRECTION RATIOS

### Short Answer Questions

1. If the line makes angles  $\alpha, \beta, \gamma$  with the +ve directives of  $X, Y, Z$  axes, what is the value of  $\sin^2 \alpha + \sin^2 \beta + \sin^2 \gamma$ ?
2. What are the direction cosines of the line joining the points  $(-4, 1, 7)$  and  $(2, -3, 2)$ .
3. If  $(6, 10, 10)$ ,  $(1, 0, -5)$ ,  $(6, -10, 0)$  are the vertices of a triangle, find the direction ratios of its sides. Also show that it is a right angle triangle.
4. Find the ratio in which the  $XZ$ -plane divides the line joining  $A(-2, 3, 4)$  and  $B(1, 2, 3)$ .
5. Show that the lines  $PQ$  and  $RS$  are parallel, if  $P = (2, 3, 4)$ ,  $Q(4, 7, 8)$ ,  $R = (-1, -2, 1)$ ,  $S = (1, 2, 5)$ .

### Essay Questions:

1. Find the direction cosines two lines which are connected by the relation  $l + m + n = 0$  and  $mn - 2nl - 2lm = 0$ .
2. Find the direction cosines of two lines which are connected by the relation  $l - 5m + 3n = 0$  and  $7l^2 + 5m^2 - 3n^2 = 0$ .
3. Find the angle between the lines where direction cosines are given by the equations  $3l + m + 5n = 0$  and  $6mn - 2nl + 5lm = 0$ .
4. Find the angle between the lines where direction cosines satisfy equations  $l + m + n = 0$ ,  $l^2 + m^2 - n^2 = 0$ .

**TELANGANA STATE BOARD OF INTERMEDIATE EDUCATION, HYDERABAD**

**VOCATIONAL BRIDGE COURSE**

**Second Year - Paper – II (w.e.f. 2016-2017)**

**MATHEMATICS SYLLABUS**

**UNIT – I**

**COMPLEX NUMBERS**

**01 COMPLEX NUMBERS (9 hours)**

- 1.1 Complex number as an ordered pair of elementary operations
- 1.2 Expressing the complex numbers in the form of  $a + ib$
- 1.3 Modulus and amplitude form of a complex number
- 1.4 Polar form and Argand plane.

**02 QUADRATIC EXPRESSIONS AND EQUATIONS (06 hours)**

- 2.1 Solving Quadratic Equations and finding nature of roots
- 2.2 Finding out Maximum and minimum values of a Quadratic expression (upto 3(a) – exercise in PAPER-II (A))
- 2.3 Relation between coefficients and roots of the equations upto 4th order.

**03 BINOMIAL THEOREM (11 hours)**

- 3.1 Binomial Theorem for Positive Index.
- 3.2 Problems on expansions, middle terms. Finding out coefficients of  $x^p$  and independent terms

**04 PARTIAL FRACTIONS (06 hours)**

- 4.1 Rational Fractions
- 4.2 Non repeated linear factors, repeated linear factors and irreducible non repeated factors

**05 MEASURES OF DISPERSION (10 hours)**

- 5.1 Range
- 5.2 Mean Deviation
- 5.3 Variance and standard deviation for grouped and un grouped data
- 5.4 Coefficient of variance with equal means and different variances in Frequency distribution analysis
- 5.5 Solved Problems

**COORDINATE GEOMETRY**

**06 CIRCLES (22 hours)**

- 6.1 Equation of a circle, standard form centre and radius.
- 6.2 Position of point in the plane of a circle. Definition of a tangent
- 6.3 Position of a straight line in the plane of a circle. Condition for a line to be tangent

**07 SYSTEM OF CIRCLES (11 hours)**

- 7.1 Relative positions of two circles
- 7.2 Angle between two measuring circles
- 7.3 Radical axis of two circles

**08 PARABOLA (10 hours)**

- 8.1 Conic sections – Equation of a Parabola in standard form (without proof)
- 8.2 Tangent and Normal at a point on the Parabola

**09 ELLIPSE (06 hours)**

- 9.1 Equation of an ellipse in standard form
- 9.2 Tangent and normal at a point on the ellipse

**10 HYPERBOLA (05 hours)**

- 10.1 Equation of a Hyperbola in standard form
- 10.2 Tangent and normal at a point of hyperbola



## **CALCULUS**

### **11 INDEFINITE INTEGRATION (18 hours)**

- 11.1 Methods of Integration
- 11.2 Integration of different types of functions
- 11.3 Integration of methods of substitution
- 11.4 Reduction formulae (without proof). Problems only

### **12 DEFINITE INTEGRALS (12 hours)**

- 12.1 Fundamental theorem of integral calculus
- 12.2 Properties of definite integrals
- 12.3 Reduction formulae (without proofs) only problems

### **13 DIFFERENTIAL EQUATIONS (08 hours)**

- 13.1 Formation of differential equations – Degree and order of an ordinary differential equation
- 13.2 Solving Differential equations
  - 1- Variables separable method
  - 2- Homogeneous differential equations

### **14 PERMUTATIONS & COMBINATIONS (03 hours)**

- 14.1 Definition of Permutation and Combination
- 14.2 Simple problems

### **15 PROBABILITY (07 hours)**

- 15.1 Definition of Probability
- 15.2 Random experiment and events
- 15.3 Additional and Multiplication theorems (without proof)

**TOTAL PERIODS - 150**

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**TELANGANA STATE BOARD OF INTERMEDIATE EDUCATION, HYDERABAD**

**VOCATIONAL BRIDGE COURSE**

**Second Year - Paper – II (w.e.f. 2016-2017)**

**MATHEMATICS WEIGHTAGE OF MARKS**

<b>S.No.</b>	<b>Unit</b>	<b>Weightage of Marks</b>
1.	Algebra	31
2.	Calculus	32
3.	Coordinate Geometry	28
4.	Probability / Measures of Dispersion	29
<b>Total</b>		<b>120 Marks</b>

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**TELANGANA STATE BOARD OF INTERMEDIATE EDUCATION, HYDERABAD**  
**VOCATIONAL BRIDGE COURSE**

**Second Year - Paper – II (w.e.f. 2016-2017)**

**MATHEMATICS SCHEME OF EXAMINATION (WEIGHTAGE)**

**Total Questions : 15**

**Time: 3 Hours**

**Max.Marks: 75**

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**Note:** In section A – Answer all Questions  
In section B – Answer any three Questions

**Section – A**

**10x3=30**

**Note:**

- i) *Answer all the questions*
- ii) *Each question carries 2 marks.*

- 1. From Algebra
- 2. From Algebra
- 3. From Algebra
- 4. From Calculus
- 5. From Calculus
- 6. From Calculus
- 7. From Co-ordinate Geometry
- 8. From Co-ordinate Geometry
- 9. From Measures of Dispersion
- 10. From Probability

**Section – B**

**3x15=45**

**Note:**

- i) *Answer any 3 questions*
- ii) *Each question carries 15 marks.*

- 11. From Algebra with internal choice
- 12. From Calculus with internal choice
- 13. From Co-ordinate Geometry with internal choice
- 14. From Probability and Measures of Dispersion with internal choice
- 15. I(a) – From Algebra  
I(b) – From Calculus

**OR**

- II(a) – from Co-ordinate Geometry
- II(b) – from Probability / Measures of Dispersion.

**TELANGANA STATE BOARD OF INTERMEDIATE EDUCATION, HYDERABAD**

**VOCATIONAL BRIDGE COURSE**

**MATHEMATICS – Second Year (w.e.f. 2016-2017)**

**MODEL QUESTION PAPER**

**Time: 3 Hours**

**Max.Marks: 75**

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**Section – A**

**10x3=30**

**Note:**

i) *Answer all questions*

ii) *Each question carries 3 marks.*

1. Express  $\frac{2+5i}{3-2i} + \frac{2-5i}{3+2i}$  in the form of  $a + ib$ .

2. Obtain the quadratic equation whose roots are  $\frac{m}{n}, \frac{-n}{m}$ . ( $m \neq 0, n \neq 0$ ).

3. Find the Coefficient of  $x^{11}$  in  $\left(2x^2 + \frac{3}{x^3}\right)^{13}$ .

4. Evaluate  $\int \frac{1+\cos 2x}{1-\cos 2x} dx$

5. Evaluate  $\int x^2 e^x dx$

6. Evaluate  $\int_0^1 \frac{1}{1+x^2} dx$

7. Find the equation of the circle whose extremities of a diameter are  $(7, -3)$  and  $(3, 5)$ .

8. Find the eccentricity and latus rectum of the hyperbola  $x^2 - 4y^2 = 4$ .

9. Find the mean deviation about the mean for the data 3, 6, 10, 4, 9, 10.

10. Two dice are rolled. Find the probability that none of the dice shows the number 2.

## Section – B

3x15=45

**Note:**

- i) Answer any 3 questions  
 ii) Each question carries 15 marks.

11. I (a) Show that the coefficients of  $x^{11}$  and  $x^{12}$  in the expansion  $\left(2 + \frac{8x}{3}\right)^{20}$  are equal.

I (b) Resolve  $\frac{1}{(1-3x)(1-2x)^2}$  into Partial fractions.

**OR**

II (a) If  $\alpha, \beta$  are the roots of  $ax^2 + bx + c = 0$ , then find

(i)  $\alpha^2 + \beta^2$  (ii)  $\alpha^3 + \beta^3$  (iii)  $\frac{1}{\alpha^2} + \frac{1}{\beta^2}$ .

II (b) If  $(n+1)P_5 : nP_5 = 3 : 2$ , then find the value of 'n'.

12. I (a) Evaluate  $\int \frac{\sec^2 x}{(1 + \tan x)^3} dx$ .

I (b) Evaluate  $\int_0^1 \frac{dx}{\sqrt{3-2x}}$ .

**OR**

II (a) Evaluate  $\int_0^2 \frac{dx}{4+5\cos x}$ .

II (b) Solve:  $\frac{dy}{dx} = \frac{xy+y}{xy+x}$ .

13. I (a) Show that the line  $x + y + 1 = 0$  touches the circle  $x^2 + y^2 - 3x + 7y + 14 = 0$  and find its point of contact.

I (b) Find the equation of the parabola whose focus is (3,5) and vertex is at the point (1,3)

**OR**

II (a) Find the equation of the ellipse whose focus is (1, -1), eccentricity is  $\frac{2}{3}$  and directrix in  $x + y + 2 = 0$ .

II (b) Find the equation of the hyperbola passing through the point (1, -1) and whose asymptotes are the lines  $x + 2y + 3 = 0$  and  $3x + 4y + 5 = 0$ .

14. I (a) Find the probability that a non-leap year contains (i) 52 Mondays (ii) 53 Mondays

I (b) Find the mean deviation about the median for the following data:

$$x_i : 5 \quad 7 \quad 9 \quad 10 \quad 12 \quad 15$$

$$f_i : 8 \quad 6 \quad 2 \quad 2 \quad 2 \quad 6$$

**OR**

II (a) A and B are two events such that  $P(A \cup B) = 0.65$  and  $P(A \cap B) = 0.15$ . Then find the value of  $P(A^c) + P(B^c)$ .

II (b) Find the variance and standard deviation of the data: 5,12,3,18,6,8,2,10.

15. I (a) Resolve into Partial Fractions:  $\frac{2x^2 + 3x + 4}{(x-1)(x^2 + 2)}$

I (b) Solve:  $(x^2 - y^2) \frac{dy}{dx} = xy$

**OR**

II (a) Find the internal and external center of similitude of the circles  $x^2 + y^2 = 9$  and  $x^2 + y^2 - 16x + 2y + 9 = 0$ .

II (b) Find the standard Deviation for the data:

$$x_i : 6 \quad 10 \quad 14 \quad 18 \quad 24 \quad 28 \quad 30$$

$$f_i : 2 \quad 4 \quad 7 \quad 12 \quad 8 \quad 4 \quad 3$$

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**VOCATIONAL BRIDGE COURSE**

**MATHEMATICS – Second Year (w.e.f. 2016-2017)**

**QUESTION BANK**

**1. COMPLEX NUMBERS**

1. If  $Z_1 = (3, 5)$  and  $Z_2 = (2, 6)$  find (i)  $Z_1 Z_2$  (ii)  $\frac{Z_1}{Z_2}$ .
2. If  $Z_1 = (6, 3)$  and  $Z_2 = (2, -1)$  find (i)  $Z_1 Z_2$  (ii)  $\frac{Z_1}{Z_2}$ .
3. If  $Z = (\cos \theta, \sin \theta)$  find  $\left( Z - \frac{1}{2} \right)$ .
4. Find the multiplicative inverse of (i)  $(\sin \theta, \cos \theta)$  (ii)  $(7, 24)$  (iii)  $(-2, 1)$ .
5. Express the following complex numbers in the form of  $a + ib$ :  
(i)  $(2 - 3i)(3 + 4i)$  (ii)  $\frac{a - ib}{a + ib}$  (iii)  $\frac{4 + 3i}{(2 + 3i)(4 - 3i)}$  (iv)  $\frac{2 + 5i}{3 - 2i} + \frac{2 - 5i}{3 + 2i}$
6. Find the conjugate of the following complex numbers:  
(i)  $(15 + 3i) - (4 - 20i)$  (ii)  $(2 + 5i)(-4 + 6i)$  (iii)  $\frac{5i}{7 + i}$
7. Find a square root of the following complex numbers:  
(i)  $7 + 24i$  (ii)  $-8 - 6i$  (iii)  $-47 + i.8\sqrt{3}$  (iv)  $-5 + 12i$
8. If  $(a + ib)^2 = x + iy$ , find  $x^2 + y^2$ .
9. If  $(x - iy)^{1/3} = a - ib$ , then show that  $\frac{x}{a} + \frac{y}{b} = 4(a^2 - b^2)$ .
10. Express  $\left( \frac{a + ib}{a - ib} \right)^2 - \left( \frac{a - ib}{a + ib} \right)^2$  in the form of  $x + iy$ .
11. Express the following complex numbers in modules – amplitude form:  
(i)  $1 - i$  (ii)  $1 + i\sqrt{3}$  (iii)  $-1 - i\sqrt{3}$  (iv)  $\sqrt{3} + i$
12. Express  $-\sqrt{7} + i\sqrt{21}$  in polar form.
13. Express  $-1 - i$  in polar form.

## 2. QUADRATIC EXPRESSIONS

- Find the value of  $K$ , if the equation  $x^2 + 2(K+2)x + 9K = 0$  has equal roots.
- Find the nature of the roots of the following equations
  - $4x^2 - 20x + 25 = 0$
  - $3x^2 + 7x + 2 = 0$
  - $2x^2 - 8x + 3 = 0$
  - $9x^2 - 30x + 25 = 0$
  - $x^2 - 12x + 32 = 0$
  - $2x^2 - 7x + 10 = 0$
- Obtain the quadratic equations whose roots are given below:
  - $\frac{m}{n}, -\frac{n}{m}$  ( $m \neq 0, n \neq 0$ )
  - $-3 \pm 5i$
- If the following equations have equal roots, find the value of  $m$ :
  - $(m+1)x^2 = 2(m+3)x + (m+8) = 0$
  - $(3m+1)x^2 = 2(m+1)x + m = 0$
  - $(2m+1)x^2 + 2(m+3)x + (m+5) = 0$
  - $x^2 - m(2x-8) - 15 = 0$
- Find the minimum & maximum values of the following quadratic expressions:
  - $3x^2 + 2x + 11$
  - $2x - 7 - 5x^2$
  - $4x - 5x^2 + 2$
  - $x^2 - 5x + 6$
  - $15 + 4x - 3x^2$
  - $x^2 - x + 7$
  - $12x - x^2 - 32$
  - $2x + 5 - 3x^2$
  - $ax^2 + bx + a$  ( $a \neq 0, a \in \mathbb{R}, b \in \mathbb{R}$ )
- If  $\alpha, \beta$  are the roots of the equation  $ax^2 + bx + c = 0$ , then find the following:
  - $\alpha^3 + \beta^3$
  - $\alpha^2 + \beta^2$
  - $\frac{1}{\alpha^2} + \frac{1}{\beta^2}$
  - $\alpha^4\beta^7 + \alpha^7\beta^4$
  - $\frac{\alpha^2 + \beta^2}{\alpha^{-2} + \beta^{-2}}$  ( $c \neq 0$ )
- If  $\alpha, \beta, \nu$  are the roots of equations  $4x^3 - 6x^2 + 7x + 3 = 0$ , then find  $\alpha\beta + \beta\nu + \nu\alpha$ .
- If the product of the roots of the equation  $4x^3 + 16x^2 - 9x - a = 0$ , then find 'a'.
- If  $-1, 2, \alpha$  are the roots of the equation  $2x^3 + x^2 - 7x - 6 = 0$ , then find 'α'.
- If  $1, \alpha, \beta$  are the roots of  $x^3 - 2x^2 - 5x + 6 = 0$ , then find  $\alpha$  and  $\beta$ .
- If  $\alpha, \beta, \nu$  are the roots of  $x^3 + px^2 + qx + r = 0$ , then find  $\sum \frac{1}{\alpha^2\beta^2}$  and  $\sum \frac{1}{\alpha}$ .
- Solve the equation  $x^3 - 3x^2 - 16x + 48 = 0$ , given that the sum of two of its roots is zero.
- Find the condition that  $x^3 - px^2 - qx - r = 0$  may have the sum of two of its roots is zero.



14. Find the relation between the roots and the coefficients of the equation

$$3x^3 - 10x^2 + 7x + 10 = 0.$$

15. If 1, 2, 3, 4 are the roots of  $x^4 + ax^3 + bx^2 + cx + d = 0$ , then find the values of  $a, b, c, d$ .

16. From a polynomial equation of the lowest degree, whose roots are

(i)  $-2, -2, 2, 2$  and (ii)  $1, 3, 5, 7$

### 3. BINOMIAL THEOREM

1. Write and simplify the first three terms of the expansions

(i)  $\left(\frac{2x}{3} + \frac{7y}{4}\right)^5$     (ii)  $\left(\frac{2p}{5} - \frac{3q}{7}\right)^6$     (iii)  $(3x - 14y)^7$

2. Write down the last three terms of the expansions

(i)  $(4x + 5y)^7$     (ii)  $(3x - 4y)^{10}$     (iii)  $(2a + 5b)^8$

3. Find the number of terms in the following expansions. Also, find the middle term (s) in each expansion

(i)  $\left(\frac{3a}{4} + \frac{b}{2}\right)^9$     (ii)  $\left(\frac{3p}{4} - 5q\right)^{14}$     (iii)  $(2x + 3y)^7$

4. Find the term independent of  $x$  in the expansions:

(i)  $\left(\sqrt{x/3} + \frac{3}{2x^3}\right)^{10}$     (ii)  $\left(4x^3 + \frac{7}{x^2}\right)^{14}$     (iii)  $\left(\frac{2x^2}{5} + \frac{15}{4x}\right)^9$     (iv)  $\left(\frac{\sqrt{x}}{3} - \frac{4}{x^2}\right)^{10}$

5. Find the coefficient of

(i)  $x^{-6}$  in  $\left(3x - \frac{4}{x}\right)^{10}$     (ii)  $x^{11}$  in  $\left(2x^2 + \frac{3}{x^3}\right)^{13}$     (iii)  $x^{-7}$  in  $\left(\frac{2x^2}{3} - \frac{5}{4x^5}\right)^7$

(iv)  $x^2$  in  $\left(7x^3 - \frac{2}{x^2}\right)^9$     (v)  $x^9$  in  $\left(2x^2 - \frac{1}{x}\right)^{20}$     (vi)  $x^{10}$  in  $\left(ax^2 + \frac{1}{bx}\right)^{11}$

(vii)  $x^{-10}$  in  $\left(ax - \frac{1}{bx^2}\right)^{11}$

6. Write and simplify

(i) 6<sup>th</sup> term in  $\left(\frac{2x}{3} + \frac{3y}{2}\right)^9$     (ii) 7<sup>th</sup> term in  $(3x - 4y)^{10}$

(iii)  $r^{\text{th}}$  term in  $\left(\frac{3a}{5} + \frac{5b}{7}\right)^8$ ,  $(1 \leq r \leq 9)$

7. Find the middle term (s) in

(i)  $\left(\frac{3}{a^3} + 5a^4\right)^{20}$       (ii)  $(4x^2 + 5x^3)^{17}$       (iii)  $\left(4a + \frac{3b}{2}\right)^{11}$       (iv)  $\left(\frac{3x}{7} - 2y\right)^{10}$

8. Find the coefficients of  $x^{32}$  and  $x^{-18}$  in the expansion  $\left(2x^3 - \frac{3}{x^2}\right)^{14}$ .

9. Show that the coefficients of  $x^{11}$  and  $x^{12}$  in the expansion  $\left(2 + \frac{8}{3}x\right)^{20}$  are equal.

#### 4. PARTIAL FRACTIONS

Resolve the following into Partial fractions.

1)  $\frac{5x+1}{(x-1)(x+2)}$

2)  $\frac{2x+3}{(x+2)(2x+1)}$

3)  $\frac{13x+43}{(2x+5)(x+6)}$

4)  $\frac{x^2+5x+7}{(x-3)^3}$

5)  $\frac{1}{(x-1)^2(x-2)}$

6)  $\frac{x-1}{(x-2)^2(x+1)}$

7)  $\frac{5x+6}{(x+2)(1-x)}$

8)  $\frac{x+4}{(x^2-4)(x+1)}$

9)  $\frac{2x+3}{(x-1)^3}$

10)  $\frac{x^2-x+1}{(x+1)(x-1)^2}$

11)  $\frac{1}{(1-3x)(1-2x)^2}$

12)  $\frac{2x^2+3x+4}{(x-1)(x^2+2)}$

13)  $\frac{x^2-3}{(x+2)(x^2+1)}$

14)  $\frac{3x-1}{(x+2)(x^2-x+1)}$

15)  $\frac{3x^2+2x}{(x^2+2)(x-3)}$

16)  $\frac{3x}{(x-1)(x-2)^2}$

#### 5. MEASURES OF DISPERSION

1. Find the mean deviation about the mean for the following data:

(i) 38, 70, 48, 42, 55, 63, 46, 54, 44.

(ii) 3, 6, 10, 4, 10, 9

(iii) 6, 7, 10, 12, 13, 4, 12, 16.

2. Find the mean deviation from median for the following data:

(i) 6, 7, 10, 12, 13, 4, 12, 16.

(ii) 13, 17, 16, 11, 13, 10, 16, 11, 18, 12, 17.

(iii) 4, 6, 9, 3, 10, 13, 2.

3. Find the mean deviation about the mean for the following distribution:

(i) 

$xi$	10	11	12	13
$fi$	3	12	18	12

(ii) 

$xi$	10	30	50	70	90
$fi$	4	24	28	16	8

(iii) 

$xi$	2	5	7	8	10	35
$fi$	6	8	10	6	8	2

4. Find the mean deviation about median for the following frequency distribution:

(i) 

$xi$	5	7	9	10	12	15
$fi$	8	6	2	2	2	6

(ii) 

$xi$	6	9	3	12	15	13	21	22
$fi$	4	5	3	2	5	4	4	3

5. Find the Variance and standard deviation of the following data:

(i) 5, 12, 3, 4, 18, 6, 8, 2, 10.

(ii) 6, 7, 10, 12, 13, 4, 8, 12.

(iii) 350, 361, 370, 373, 376, 379, 385, 387, 394, 395.

6. Find the variance and standard deviation of the following frequency distribution:

(i) 

$xi$	6	10	14	18	24	28	30
$fi$	2	4	7	12	8	4	3

(ii) 

$xi$	4	8	11	1	20	24	32
$fi$	3	5	9	5	4	3	1

7. Find the mean deviation about the mean for the following continuous distribution:

(i)

Hight (in cms)	95-105	105-115	115-125	125-135	135-145	145-155
Number of boys	9	13	26	30	12	10

(ii)

Sales (in Rs. thousands)	40-50	50-60	60-70	70-80	80-90	90-100
Number of comapnies	5	15	25	30	20	5

(iii)

Marks obtained	0-10	10-20	20-30	30-40	40-50
Number of students	8	8	15	16	6

8. Find the mean deviation about the median for the following continuous distribution:

(i)

Marks obtained	0-10	10-20	20-30	30-40	40-50	50-60
Number of boys	6	8	14	16	4	2

(ii)

Class Interval	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Frequency	5	8	7	12	28	20	10	10

(iii)

Age (years)	20-25	25-30	30-35	35-40	40-45	45-50	50-55	55-60
Number of workers	120	125	175	160	150	140	100	30

9. Calculate the variance and standard deviation of the following continuous frequency distribution:

(i)

Class interval	30-40	40-50	50-60	60-70	70-80	80-90	90-100
Frequency	3	7	12	15	8	3	2

(ii)

Age in years	20-30	30-40	40-50	50-60	60-70	70-80	80-90
Number of members	3	61	32	153	140	51	2

10. Find the mean deviation from the mean of the following data, using step deviation method.

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Number of Students	6	5	8	15	7	6	3

11. The coefficient of variation of two distributions are 60 and 70 and their standard deviations are 21 and 16 respectively. Find their arithmetic means.

12. From the prices of shares X and Y given below, for 10 days of trading, find out which share is more stable?

X	35	54	52	53	56	58	52	50	51	49
Y	108	107	105	105	106	107	104	103	104	101

13. An analysis of monthly wages paid to the workers of two firms A and B belonging to the same industry gives the following data:

	Firm A	Firm B
Number of workers	500	600
Average daily wages (Rs.)	186	175
Variance of distribution of wages	81	100

(i) Which firm A or B, has greater variability in individual wages?

(ii) Which firm has larger wage bill?

14. The scores of two cricketers A and B in 10 innings are given below. Find who is a better run getter and who is a more consistent player.

$x_i$ Scores of A:	40	25	19	80	38	8	67	121	66	76
$y_i$ Scores of B:	28	70	31	0	14	111	66	31	25	4

## 6. THE CIRCLE

1. Find the equation of the circle whose centre (C) and radius (r) are as given below:
 

(i) $C = (1,4); r = 5$	(ii) $C = (-1, 2); r = 4$	(iii) $C = (a, -b); r = a + b$
(iv) $C = (a, -b); r = \sqrt{a^2 - b^2} ( a  >  b )$	(v) $C = (\cos \alpha, \sin \alpha); r = 1$	
(vi) $C = (-7, -3); r = 4$	(vii) $C = \left(\frac{5}{2}, -\frac{4}{3}\right); r = 6$	(viii) $C = (1, 7); r = \frac{5}{2}$
(ix) $C = (0, 0); r = 9$	(x) $C = \left(-\frac{1}{2}, -9\right); r = 5$	
  
2. Find the centre and the radius for the following circles:
 

(i) $x^2 + y^2 + 2x - 4y - 4 = 0$	(ii) $3x^2 + 3y^2 - 6x + 4y - 4 = 0$
(iii) $x^2 + y^2 - 4x - 8y - 41 = 0$	(iv) $3x^2 + 3y^2 - 5x - 6y + 4 = 0$
(v) $2x^2 + 2y^2 - 3x + 2y - 1 = 0$	(vi) $2x^2 + 2y^2 - 4x + 6y - 3 = 0$
(vii) $x^2 + y^2 + 2ax - 2by + b^2 = 0$	
  
3. Find the equation of the circle passing through the point (5, 6) and having the centre at the point (-1, 2).
  
4. (2, 3) is the centre of the circle represented by the equation  $x^2 + y^2 + ax + by - 12 = 0$ . Find the values of  $a$  and  $b$ . Also, find the radius of the circle.
  
5. Find 'a' if the radius of the circle  $x^2 + y^2 - 4x + 6y + a = 0$  is 4.
  
6. Find the equations of the circles whose extremities of a diameter are given below:
 

(i) (1, 2), (4, 5)	(ii) (-4, 3), (3, -4)	(iii) (8, 6), (1, 2)	(iv) (4, 2), (1, 5)	(v) (7, -3), (3, 5)
(vi) (1, 1), (2, -1)	(vii) (3, 1), (2, 7)	(viii) (0, 0), (8, 5)	(ix) (1, 2), (4, 6)	
  
7. Find the equation of the circle passing through three points as given below:
 

(i) (1, 1), (-2, 2), (-6, 0)	(ii) (1, 2), (3, -4), (19, 8)
(iii) (3, 4), (3, 2), (1, 4)	(iv) (2, 1), (5, 5), (-6, 7)
(v) (5, 7), (8, 1), (1, 3)	(vi) (9, 1), (7, 9), (6, 10)
(vii) (5, 2), (7, 0), (-1, -4)	(viii) (2, 0), (0, 1), (4, 5)
(ix) (0, 0), (2, 0), (0, 2)	(x) (1, 1), (3, 2), (2, -1)

8. Find the positions of the following points with respect to the following circles. Also state the powers of the points:
- $P = (2, 4); S \equiv x^2 + y^2 - 4x - 6y + 11 = 0$
  - $P = (3, 4); S \equiv x^2 + y^2 - 4x - 6y + 12 = 0$
  - $P = (1, 5); S \equiv x^2 + y^2 - 2x - 4y + 3 = 0$
  - $P = (2, -1); S \equiv x^2 + y^2 - 2x - 4y + 3 = 0$
  - $P = (4, 2); S \equiv 2x^2 + 2y^2 - 5x - 4y - 3 = 0$
  - $P = (1, 2); S \equiv x^2 + y^2 + 6x + 8y - 96 = 0$
  - $P = (5, -6); S \equiv x^2 + y^2 + 8x + 12y + 15 = 0$
  - $P = (2, 3); S \equiv x^2 + y^2 - 2x + 8y - 23 = 0$
  - $P = (0, 0); S \equiv x^2 + y^2 - 14x + 2y + 25 = 0$
  - $P = (-2, 5); S \equiv x^2 + y^2 - 25 = 0$
9. Find the length of the tangent from
- $P = (1, 3)$  to the circle  $S \equiv x^2 + y^2 - 2x + 4y - 11 = 0$
- $P = (12, 17)$  to the circle  $S \equiv x^2 + y^2 - 6x - 8y - 125 = 0$
- $P = (0, 0)$  to the circle  $S \equiv x^2 + y^2 - 14x + 2y + 25 = 0$
- $P = (-2, 5)$  to the circle  $S \equiv x^2 + y^2 - 25 = 0$
- $P = (2, 5)$  to the circle  $S \equiv x^2 + y^2 - 5x + 4y - 5 = 0$
10. If the length of the tangent from the point  $(5, 4)$  to the circle  $x^2 + y^2 + 2ky = 0$  is 1, then find K.
11. If the length of the tangent from the point  $(2, 5)$  to the circle  $x^2 + y^2 - 5x + 4y + k = 0$  is  $\sqrt{37}$ , then find K.
12. A point P moves such that the lengths of tangents from it to the circles  $x^2 + y^2 - 4x - 6y - 12 = 0$  and  $x^2 + y^2 + 6x + 18y + 26 = 0$  are in the ratio 2:3. Then find the equation to the locus of P.
13. A point P moves such that the lengths of tangents from it to the circles  $x^2 + y^2 + 8x + 12y + 15 = 0$  and  $x^2 + y^2 - 4x - 6y - 12 = 0$  are equal. Then find the equation to the locus of P.

14. A point P moves such that the lengths of tangents from it to the circles  $x^2 + y^2 - 2x + 4y - 20 = 0$  and  $x^2 + y^2 - 2x - 8y + 1 = 0$  are in the ratio 2:1. Then find the equation to the locus of P.
15. Find the equation of tangent at (-1,1) to the circle  $x^2 + y^2 - 6x + 4y - 12 = 0$ .
16. Find the point of contact of the line  $4x - 3y + 7 = 0$  with the circle  $x^2 + y^2 - 6x + 4y - 12 = 0$ .
17. Find the equation of tangent at:
- (7, -5) to the circle  $x^2 + y^2 - 6x + 4y - 12 = 0$ .
  - (-1, 2) to the circle  $x^2 + y^2 - 4x - 8y + 7 = 0$ .
  - (-6, -9) to the circle  $x^2 + y^2 + 4x + 6y - 39 = 0$ .
  - (3, 4) to the circle  $x^2 + y^2 - 4x - 6y + 11 = 0$ .
  - (3, 2) to the circle  $x^2 + y^2 - x - 3y - 4 = 0$ .
  - (1, 1) to the circle  $2x^2 + 2y^2 - 2x - 5y + 3 = 0$ .
  - (3, -2) to the circle  $x^2 + y^2 = 13$ .
18. Show that  $x + y + 1 = 0$  is a tangent to the circle  $x^2 + y^2 - 3x + 7y + 14 = 0$  and find its point of contact.

## 7. SYSTEM OF CIRCLES

1. State the relative positions of the following pairs of circles:
- $x^2 + y^2 - 14x + 6y + 33 = 0$ ;  $x^2 + y^2 + 30x - 2y + 1 = 0$
  - $x^2 + y^2 - 8x - 6y + 21 = 0$ ;  $x^2 + y^2 - 2y - 15 = 0$
  - $x^2 + y^2 + 6x + 18y + 26 = 0$ ;  $x^2 + y^2 - 4x - 6y - 12 = 0$
  - $x^2 + y^2 - 4x - 6y - 12 = 0$ ;  $5x^2 + 5y^2 - 8x - 14y - 32 = 0$
  - $x^2 + y^2 + 6x + 6y + 14 = 0$ ;  $x^2 + y^2 - 2x - 4y - 4 = 0$
  - $x^2 + y^2 - 2x + 4y - 4 = 0$ ;  $x^2 + y^2 + 4x - 6y - 3 = 0$
  - $(x - 2)^2 + (y + 1)^2 = 9$ ;  $(x + 1)^2 + (y - 3)^2 = 4$



2. Find the internal centre of similitude of the circles  $x^2 + y^2 - 2x - 6y + 9 = 0$  and  $x^2 + y^2 + 6x - 2y + 1 = 0$ .
3. Find the external centre of similitude of the circles  $x^2 + y^2 = 4$  and  $x^2 + y^2 - 2x - 6y + 9 = 0$ .
4. Find the internal centre of similitude of the circles  $x^2 + y^2 - 4x - 10y + 28 = 0$  and  $x^2 + y^2 + 4x - 6y + 4 = 0$
5. Find the external centre of similitude of the circles  $x^2 + y^2 + 22x - 4y - 100 = 0$  and  $x^2 + y^2 - 22x + 4y + 100 = 0$
6. Find the internal and external centre of similitude of the circles  $x^2 + y^2 - 14x + 6y + 33 = 0$  and  $x^2 + y^2 + 30x - 2y + 1 = 0$
7. Find the internal and external centres of similitude of the circles  $x^2 + y^2 = 9$  and  $x^2 + y^2 - 16x + 2y + 49 = 0$
8. Find the internal and external centres of similitude of the circles  $x^2 + y^2 - 4x - 2y + 4 = 0$  and  $x^2 + y^2 + 4x + 2y - 4 = 0$
9. Find the angle between the following pairs of circles:
  - (i)  $x^2 + y^2 + 4x - 14y + 28 = 0$ ;  $x^2 + y^2 + 4x - 5 = 0$
  - (ii)  $x^2 + y^2 - 12x - 6y + 41 = 0$ ;  $x^2 + y^2 + 4x + 6y - 59 = 0$
  - (iii)  $x^2 + y^2 + 2ax + 8 = 0$ ;  $x^2 + y^2 + 2by - 8 = 0$
  - (iv)  $x^2 + y^2 + 4x + 8 = 0$ ;  $x^2 + y^2 - 16y - 8 = 0$
  - (v)  $x^2 + y^2 - 6x - 8y + 12 = 0$ ;  $x^2 + y^2 - 4x + 6y - 24 = 0$
  - (vi)  $x^2 + y^2 - 5x - 14y - 34 = 0$ ;  $x^2 + y^2 + 2x + 4y + 1 = 0$
  - (vii)  $x^2 + y^2 - 4x + 14y - 116 = 0$ ;  $x^2 + y^2 + 6x - 10y - 135 = 0$
10. Find the equations of radical axes of the following pairs of circles:
  - (i)  $x^2 + y^2 - 3x - 4y + 5 = 0$ ;  $3x^2 + 3y^2 - 7x + 8y + 11 = 0$
  - (ii)  $x^2 + y^2 + 2x + 4y + 1 = 0$ ;  $x^2 + y^2 + 4x + y = 0$
  - (iii)  $x^2 + y^2 + 4x + 6y - 7 = 0$ ;  $4x^2 + 4y^2 + 8x + 12y - 9 = 0$
  - (iv)  $x^2 + y^2 - 2x - 4y - 1 = 0$ ;  $x^2 + y^2 - 4x - 6y + 5 = 0$

11. Find the equations of common chords of the following pairs of circles:

(i)  $x^2 + y^2 - 4x - 4y + 3 = 0$ ;  $x^2 + y^2 - 5x - 6y + 4 = 0$

(ii)  $x^2 + y^2 + 2x + 3y + 1 = 0$ ;  $x^2 + y^2 + 4x + 3y + 2 = 0$

(iii)  $(x-a)^2 + (y-b)^2 = c^2$ ;  $(x-b)^2 + (y-a)^2 = c^2 (a \neq b)$

(iv)  $x^2 + y^2 - 6x - 4y + 9 = 0$ ;  $x^2 - y^2 - 8x - 6y + 23 = 0$

12. Find the equations of common tangents of the following pairs of circles:

(i)  $x^2 + y^2 + 10x - 2y + 22 = 0$ ;  $x^2 + y^2 + 2x - 8y + 8 = 0$

(ii)  $x^2 + y^2 - 2x - 4y = 0$ ;  $x^2 + y^2 - 8y - 4 = 0$

(iii)  $x^2 + y^2 - 8x - 2y + 8 = 0$ ;  $x^2 + y^2 - 2x + 6y + 6 = 0$

(iv)  $x^2 + y^2 - 2x = 0$ ;  $x^2 + y^2 + 6x - 6y + 2 = 0$

(v)  $x^2 + y^2 - 2x - 4y - 20 = 0$ ;  $x^2 + y^2 + 6x + 2y - 90 = 0$

## 8. PARABOLA

1. Find the coordinates of the vertex and focus, and the equations of directrix and axis of the following parabolas:

(i)  $y^2 = 16x$  (ii)  $x^2 = -4y$  (iii)  $y^2 = 16x$  (iv)  $3x^2 - 9x + 5y - 2 = 0$

(v)  $y^2 - x + 4y + 5 = 0$  (vi)  $y^2 + 4x + 4y - 3 = 0$

(vii)  $x^2 - 2x + 4y - 3 = 0$  (viii)  $4y^2 + 12x - 20y + 67 = 0$  (ix)  $x^2 - 6x - 6y + 6 = 0$

2. Find the equation of the parabola whose vertex is  $(3, -2)$  and focus is  $(3, 1)$ .

3. Find the equation of the parabola whose vertex is  $(1, -7)$  and focus is  $(1, -2)$ .

4. Find the equation of the parabola whose focus is  $(3, 5)$  and vertex is  $(1, 3)$ .

5. Find the coordinates of the points on the parabola  $y^2 = 8x$  whose focal distance is 10.

6. Find the coordinates of the points on the parabola  $y^2 = 2x$  whose focal distance is  $5/2$ .

7. Find the equation of the parabola passing through the points  $(-1, 2)$ ,  $(1, -1)$ ,  $(2, 1)$  and having its axis parallel to the X-axis.

8. Find the equation of the parabola passing through the points  $(-2, 1)$ ,  $(1, 2)$ ,  $(-1, 3)$  and having its axis parallel to the X-axis.

9. Find the equation of the parabola passing through the points  $(4,5), (-2,11), (-4,21)$  and having its axis parallel to the Y-axis.
10. Show that the line  $7x+6y=13$  is a tangent to the parabola  $y^2-7x-8y+14=0$  and find the point of contact.
11. Show that the line  $2x-y+2=0$  is a tangent to the parabola  $y^2=16x$  and find the point of contact also.
12. Find the value of  $k$  if the line  $2y=5x+k$  is a tangent to the parabola  $y^2=6x$ .
13. Find the equations of the tangent and normal to the parabola  $y^2=6x$  at the positive end of the latusrectum.
14. Find the equation of the tangent and normal to the parabola  $x^2-4x-8y+12=0$  at  $(4, 3/2)$ .
15. Find the equation of the normal to the parabola  $y^2=4x$  which is parallel to  $y-2x+5=0$
16. Find the equation of the normal to the parabola  $y^2=4x$  inclined at an angle  $60^\circ$  with its axis and also find the point of contact.
17. Find the equation of the tangent to the parabola  $y^2=16x$  which are parallel and perpendicular respectively to the line  $2x-y+5=0$ , also find the coordinates of their points of contact.
18. Find the position (exterior or interior or on) of the following points with respect to the parabola  $y^2=6x$  (i)  $(6, -6)$  (ii)  $(0,1)$  (iii)  $(2,3)$ .

## 9. ELLIPSE

1. Find the eccentricity, coordinates of foci, Length of latusrectum and equations of directrices of the following ellipses:
  - (i)  $9x^2+16y^2-36x+32y-92=0$  (ii)  $3x^2+y^2-6x-2y-5=0$  (iii)  $9x^2+16y^2=144$
  - (iv)  $4x^2+y^2-8x+2y+1=0$  (v)  $x^2+2y^2-4x+12y+14=0$
2. Find the equation of the ellipse referred to its major and minor axes X, Y axes respectively with latusrectum of length 4 and distance between foci  $4\sqrt{2}$ .

3. Find the equation of the ellipse in the standard form whose distance between foci is 2 and the length of the latus rectum is  $15/2$ .
4. Find the equation of the ellipse in the standard form whose distance between foci is 8 and the distance between directrices is 32.
5. Find the equation of ellipse in standard form, if it passes through the points  $(-2, 2)$  and  $(3, -1)$ .
6. If the ends of major axis of an ellipse are  $(5, 0)$ ,  $(-5, 0)$ . Find the equation of the ellipse in the standard form if its focus lies on the line  $3x - 5y - 9 = 0$ .
7. If the length of the major axis of an ellipse is three times the length of its minor axis then find the eccentricity of the ellipse.
8. If the length of the latusrectum is equal to half of its minor axis of an ellipse in the standard form then find the eccentricity of the ellipse.
9. If the length of the latusrectum is equal to half of its major axis of an ellipse in the standard form then find the eccentricity of the ellipse.
10. Find the equation of the ellipse in the form  $\frac{(x-h)^2}{a^2} + \frac{(x-k)^2}{b^2} = 1$ , given the following data.
  - (i) centre  $(2, -1)$ , one end of major axis  $(2, -5)$ ,  $e = 1/3$ .
  - (ii) centre  $(4, -1)$ , one end of major axis  $(-1, -1)$  and passes through  $(8, 0)$ .
  - (iii) centre  $(0, -3)$ ,  $e = 2/3$ , semi-major axis  $5\pi$ .
  - (iv) centre  $(2, -1)$ ,  $e = 1/2$ , length of latusrectum 4.
11. Find the equation of the ellipse whose focus is  $(1, -1)$  eccentricity  $\frac{2}{3}$  and directive  $x + y + 2 = 0$
12. Find the equation of tangent and normal to the ellipse  $x^2 + 8y^2 = 33$  at  $(-1, 2)$ .
13. Find the equation of tangent and normal to the ellipse  $x^2 + 2y^2 - 4x + 12y + 14 = 0$  at  $(2, -1)$ .
14. Find the equation of the tangents to the ellipse  $9x^2 + 16y^2 = 144$  which makes equal intercepts on the coordinate axis.
15. Find the coordinates of the points on the ellipse  $x^2 + 3y^2 = 37$  at which the normal is parallel to the line  $6x - 5y = 2$ .

16. Find the value of  $k$  if the line  $4x + y + k = 0$  is tangent to the ellipse  $x^2 + 3y^2 = 3$ .
17. Find the equation of the tangents to the ellipse  $2x^2 + y^2 = 8$  which are
  - (i) parallel to  $x - 2y - 4 = 0$
  - (ii) perpendicular to  $x + y + 2 = 0$
  - (iii) which makes an angle  $\frac{\pi}{4}$  with x-axis.
18. Find the equations of tangent and normal to the ellipse  $2x^2 + 3y^2 = 11$  at the point whose ordinate is 1.
19. Find the equation of tangent and normal to the ellipse  $9x^2 + 16y^2 = 144$  at the end of the latusrectum in the first quadrant.

### 10. HYPERBOLA

1. Define rectangular hyperbola and find its eccentricity.
2. If  $e$  and  $e_1$  are the eccentricities of a hyperbola and its conjugate hyperbola prove that  $\frac{1}{e^2} + \frac{1}{e_1^2} = 1$ .
3. One focus of a hyperbola is located at the point  $(1, -3)$  and the corresponding directrix is the line  $y = 2$ . Find the equation of the hyperbola if its eccentricity is  $3/2$ .
4. Find the equations of the hyperbola whose foci are  $(\pm 5, 0)$ , the transverse axis is of length 8.
5. Find the equation of the hyperbola, whose asymptotes are the straight lines  $x + 2y + 3 = 0$ ,  $3x + 4y + 5 = 0$  and passing through  $(1, -1)$ .
6. If  $3x - 4y + k = 0$  is a tangent to  $x^2 - 4y^2 = 5$ , find the value of  $k$ .
7. If the eccentricity of the hyperbola is  $5/4$ , then find eccentricity of the conjugate hyperbola.
8. Find the equation of the hyperbola whose asymptotes are  $3x = \pm 5y$  and the vertices are  $(\pm 5, 0)$ .
9. If the angle between the asymptotes is  $30^\circ$  then find its eccentricity.
10. Find the centre, foci, eccentricity, equation of the directrices, length of the latusrectum of the hyperbola
  - (i)  $16y^2 - 9x^2 = 144$
  - (ii)  $x^2 - 4y^2 = 4$
  - (iii)  $5x^2 - 4y^2 + 20x + 8y = 4$
  - (iv)  $9x^2 - 16y^2 + 72x - 32y - 16 = 0$
  - (v)  $4x^2 - 9y^2 - 8x - 32 = 0$
  - (vi)  $4(y+3)^2 - 9(x-2)^2 = 1$

11. Find the equations of the tangents to the hyperbola  $x^2 - 4y^2 = 4$  which are  
(i) parallel (ii) perpendicular to the line  $x + 2y = 0$ .
12. Find the equations of the tangents to the hyperbola  $3x^2 - 4y^2 = 12$  which are  
(i) parallel (ii) perpendicular to the line  $y = x - 7$ .
13. Find the equations of the tangents drawn to the hyperbola  $2x^2 - 3y^2 = 6$  through  $(-2, 1)$ .
14. Show that the angle between the asymptotes of a standard hyperbola is  
 $2 \tan^{-1}\left(\frac{b}{a}\right)$  or  $2 \sec^{-1}(e)$ .
15. Find the equation of Hyperbola passing through  $(1, -1)$  and whose asymptotes are the lines  $x + 2y + 3 = 0$  and  $3x + 4y + 5 = 0$ .

## 11. INTEGRATION

**Evaluate the following:**

1.  $\int \left( \frac{x^6 - 1}{1 + x^2} \right) dx$
2.  $\int \left( \frac{2x^3 - 3x + 5}{2x^2} \right) dx$
3.  $\int (\sqrt{1 + \sin 2x}) dx$
4.  $\int (\sqrt[3]{2x^2}) dx$
5.  $\int \left( e^x - \frac{1}{x} + \frac{2}{\sqrt{1-x^2}} \right) dx$
6.  $\int \left( \frac{\sin^2 x}{1 + \cos 2x} \right) dx$
7.  $\int (x \sec^2 x - \cos x + x^2) dx$
8.  $\int \sec^2 x \operatorname{cosec}^2 x dx$
9.  $\int \frac{(a^x - b^x)^2}{a^x b^x} dx$
10.  $\int (\cosh x + \frac{1}{\sqrt{1+x^2}}) dx$
11.  $\int \frac{1}{\cosh x + \sinh x} dx$
12.  $\int \left( x^3 - \cos x + \frac{4}{\sqrt{x^2 - 1}} \right) dx$
13.  $\int \frac{1 + \cos 2x}{1 - \cos 2x} dx$
14.  $\int x^2 e^x dx$
15.  $\int \frac{\sec^2 x}{(1 + \tan x)^3} dx$
16.  $\int 2x \sin(x^2 + 1) dx$
17.  $\int \frac{(\log x)^2}{x} dx$
18.  $\int \frac{1}{8 + 2x^2} dx$
19.  $\int \frac{2}{\sqrt{25 + 9x^2}} dx$
20.  $\int \frac{3}{\sqrt{9x^2 - 1}} dx$
21.  $\int \frac{\sin x}{\sin(a + x)} dx$
22.  $\int \frac{dx}{\sqrt{1 + 5x}}$
23.  $\int 2x e^{x^2} dx$
24.  $\int \frac{x^8}{1 + x^{18}} dx$
25.  $\int \frac{e^x(1+x)}{\cos^2(xe^x)} dx$
26.  $\int \frac{2x+1}{x^2+x+1} dx$
27.  $\int \frac{\cos(\log x)}{x} dx$
28.  $\int \frac{1}{x \log x [\log(\log x)]} dx$
29.  $\int \frac{1}{(x+3)\sqrt{x+2}} dx$

$$\begin{array}{llll}
30. \int \frac{\sin(\tan^{-1}x)}{1+x^2} dx & 31. \int \frac{1}{1+\sin 2x} dx & 32. \int \frac{\cos x + \sin x}{\sqrt{1+\sin 2x}} dx & 33. \int \sin^4 x dx \\
34. \int \tan^6 x dx & 35. \int \sec^5 x dx & 36. \int \operatorname{cosec}^5 x dx & 37. \int \cot^4 x dx \\
38. \int \cos^8 x dx & & & 
\end{array}$$

## 12. DEFINITE INTEGRATION

$$\begin{array}{llll}
1. \int_0^a (a^2x - x^3) dx & 2. \int_2^3 \frac{2x}{1+x^2} dx & 3. \int_0^\pi \sqrt{2+\cos \theta} d\theta & 4. \int_0^\pi \sin^3 x \cos^3 x dx \\
5. \int_0^2 |1-x| dx & 6. \int_{-\pi/2}^{\pi/2} \frac{\cos x}{1+e^x} dx & 7. \int_0^a (\sqrt{a}-\sqrt{x})^2 dx & 8. \int_0^1 xe^{-x^2} dx \\
9. \int_0^4 \frac{x^2}{1+x} dx & 10. \int_{-1}^2 \frac{x^2}{x^2+2} dx & 11. \int_0^1 \frac{1}{\sqrt{3-2x}} dx & 12. \int_0^1 \frac{1}{1+x^2} dx \\
13. \int_0^{\pi/2} \frac{dx}{4+5\cos x} & 14. \int_0^1 \frac{x^2}{x^2+1} dx & 15. \int_0^{\pi/2} \frac{\sin^5 x}{\sin^5 x + \cos^5 x} dx & \\
16. \int_0^{1/2} \frac{x \sin^{-1} x}{\sqrt{1-x^2}} dx & 17. \int_0^a x(a-x)^n dx & 18. \int_0^2 x\sqrt{2-x} dx & 19. \int_0^1 \frac{\log(1+x)}{1+x^2} dx \\
20. \int_0^{\pi/2} \frac{\cos^{5/2} x}{\cos^{5/2} x + \sin^{5/2} x} dx & 21. \int_{\pi/6}^{\pi/3} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}} dx & 22. \int_0^{\pi/2} x \sin x dx & 23. \int_0^{\pi/2} \sin^4 x \cos^5 x dx \\
24. \int_0^{\pi/2} \sin^5 x \cos^4 x dx & 25. \int_0^{\pi/2} \sin^6 x \cos^4 x dx & 26. \int_0^{2\pi} \sin^4 x \cos^6 x dx & \\
27. \int_{-\pi/2}^{\pi/2} \sin^2 x \cos^4 x dx & 28. \int_0^{\pi/2} \sin^{10} x dx & 29. \int_0^{\pi/2} \cos^{11} x dx & 30. \int_0^{\pi/2} \cos^7 x \sin^2 x dx \\
31. \int_0^{\pi/2} \sin^4 x \cos^4 x dx & 32. \int_0^2 x^{3/2} \sqrt{2-x} dx & 33. \int_0^{\pi/2} \tan^5 x \cos^8 x dx & \\
34. \int_0^\pi (1+\cos)^3 dx & 35. \int_0^{2\pi} (1+\cos x)^5 (1-\cos x)^3 dx & & 
\end{array}$$

### 13. DIFFERENTIAL EQUATIONS

1. Form differential equation of the following family of curves by eliminating parameters given in brackets.

1)  $xy = ae^x + be^{-x} (a, b)$

2)  $y = (a + bx)e^k; (a, b)$

3)  $y = a \cos(nx + b) (a, b)$

4)  $y = ae^{3x} + be^{4x} (a, b)$

5)  $y = ax^2 + bx (a, b)$

6)  $ax^2 + by^2 = 1 (a, b)$

1. Solve the differential equation  $\frac{dy}{dx} = e^{x+y}$

2. Solve the differential equation  $y^2 - x \frac{dy}{dx} = a \left( y + x \frac{dy}{dx} \right)$

3. Solve the differential equation  $\frac{dy}{dx} = \frac{y^2 + 2y}{x - 1}$

4. Solve the differential equation  $\frac{dy}{dx} = \frac{x(2 \log x + 1)}{\sin y + y \cos y}$

5. Solve the differential equation  $\frac{dy}{dx} = \sin(x + y) + \cos(x + y)$

6. Solve the differential equation  $\frac{dy}{dx} = \frac{a^2}{(x - y)^2}$

7. Solve the differential equation  $\frac{dy}{dx} = x^2 e^{3y} - x^2$

8. Solve the differential equation  $\frac{dy}{dx} = 2y \tanh x$

9. Solve the differential equation  $\frac{dy}{dx} = \tan^2(x + y)$

10. Solve the differential equation  $\frac{dy}{dx} = e^{x-y} + x^2 e^{-y}$

1. Solve  $\frac{dy}{dx} = \frac{y^2 - 2xy}{x^2 - xy}$

2. Solve  $\frac{dy}{dx} = \frac{x^2 + y^2}{2xy}$



3. Solve  $\frac{dy}{dx} = \frac{x^2 + y^2}{2x^2}$
4. Solve  $\frac{dy}{dx} = \frac{x - y}{x + y}$
5. Solve  $\frac{dy}{dx} = \frac{2xy}{x^2 + y^2}$
6. Solve  $\frac{dy}{dx} = \frac{(x + y)^2}{2x^2}$
7. Solve  $\frac{dy}{dx} = \frac{xy}{x^2 - y^2}$
8. Solve  $(y^2 - 2xy)dx + (2xy - x^2)dy = 0$
9. Solve  $(2x - y)dy = (2y - x)dx$
10. Solve  $\frac{dy}{dx} = \frac{(x + y)^2}{2x^2}$

**Find the order and Degree of the following:**

1.  $\frac{d^2y}{dx^2} = -p^2y$
2.  $\left(\frac{d^3y}{dx^3}\right)^2 - 3\left(\frac{dy}{dx}\right)^2 - e^x = 4$
3.  $\left(\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^3\right)^{6/5} = 6y$
4.  $y = c(x - c)^2$

#### 14. PERMUTATIONS & COMBINATIONS

1. If  ${}^n P_4 = 1680$  find the value of  $n$ ?
2. If  $(n + 1)P_5 : {}^n P_5 = 3 : 2$  then find the value of  $n$ ?
3. Find the number of ways of permuting the letters of the word, PICTURE so that
  - (i) all vowels come together
  - (ii) no two vowels come together
  - (iii) The relative position of vowels and consonants are not disturbed.

4. If the letters of the word PRISON are permuted in all possible ways and the words thus formed are arranged in dictionary order. Find the rank of the word 'PRISON'.
5. Find the sum of all 4-digit numbers that can be formed using the digit 1, 3, 5, 7, 9.
6. Find the number of 4 letter words that can be formed using the letters of the word. PISTON in which at least one letter is repeated.
7. Find the number of ways of seating 5 Indians, 4 Americans and 3 Russians at a round table so that
  - (i) all Indians sit together
  - (ii) no two Russians sit together
  - (iii) Persons of same nationality sit together.
8. Find the number of different chains that can be prepared using 7 different coloured beads.
9. Find the number of ways of arranging the letters of the words
  - (i) INDEPENDENCE (ii) MATHEMATICS (iii) SINGING
  - (iv) PERMUTATION (v) COMBINATION (vi) INTERMEDIATE
10. Find the number of ways of selecting 4 English 3 Telugu and 2 Hindi books out of 7 English, 6 Telugu and 5 Hindi books.
11. Find the number of ways of selecting 11 member cricket team from 7 batsmen 6 bowlers and 2 wicket keepers so that team contains 2 wicket keepers and atleast 4 bowlers.
12. Prove that  ${}^{25}C_4 + \sum_{r=0}^4 {}^{(29-r)}C_3 = {}^{30}C_4$ .
13. If  ${}^nC_{21} = {}^nC_{27}$  find  $50C_n$
14. Simplify  ${}^{34}C_5 + \sum_{r=0}^4 {}^{(38-r)}C_4$
15. Find the number of ways of forming a committee of 5 members out of 6 Indians, and 5 Americans so that always the Indians will be in majority in the committee.
16. If a set A has 12 elements find the number of subsets of A having
  - (i) 4 elements (ii) Atleast 3 elements (iii) At most 3 elements.

## 15. PROBABILITY

1. Find the probability of throwing a total score of 7 with 2 dice.
2. A page is opened at random from a book containing 200 pages what is the probability that the number on the page is a perfect square.
3. If A and B are events with  $P(A) = 0.5$ ,  $P(B) = 0.4$  and  $P(A \cap B) = 0.3$  find the probability that (i) A does not occur (ii) neither A nor B occurs.
4. Find the probability that a non-leap year contains (i) 53 Sundays (ii) 52 Sundays only.
5. Two dice are rolled. What is the probability that none of the dice shows the number '2'?
6. In an experiment of drawing a card at random from a pack, the event of getting a spade is denoted by A and getting a pictured card (King, Queen or Jack) is denoted by B. Find the probability of A, B,  $A \cap B$  and  $A \cup B$ .
7. A, B, C are 3 news papers from a city. 20% of the population read A, 16% read B, 14% read C, 8% both A and B, 5%, both A and C, 4% both B and C and 2% all the three. Find the percentage of the population who read at least one news paper.
8. If two numbers are selected randomly from 20 consecutive natural numbers, find the probability that the sum of the two numbers is (i) an even number (ii) an odd number.
9. A bag contains 12 two rupee coins 7 one rupee coins and 4 half rupee coins. If three coins are selected at random then find the probability that
  - (i) The sum of three coins is Maximum
  - (ii) The sum of three coins is minimum
  - (iii) Each coin is of different value.
10. A pair of dice is thrown. Find the probability that either of the dice shows 2 when their sum is 6.
11. Let A and B be independent events with  $P(A) = 0.2$ ,  $P(B) = 0.5$ . Find (i)  $P(A/B)$  (ii)  $P(B/A)$  (iii)  $P(A \cap B)$  and  $P(A \cup B)$ .
12. If A, B, C are three independent events of an experiment such that  $P(A \cap B^c \cap C^c) = \frac{1}{4}$ ,  
 $P(A^c \cap B \cap C^c) = \frac{1}{8}$ ,  $P(A^c \cap B^c \cap C^c) = \frac{1}{4}$ . Then find  $P(A)$ ,  $P(B)$  and  $P(C)$ .

13. A pair of dice is rolled. What is the probability that neither dice shows a 2 given that they sum to 7.
14. If A, B are two events with  $P(A \cup B) = 0.65$ ,  $P(A \cap B) = 0.15$ . Then find the value of  $P(A^c) + P(B^c)$ .
15. A pair dice is rolled. Consider the events  $A = \{1,3,5\}$ ,  $B = \{2,3\}$  and  $C = \{2,3,4,5\}$  find  
 (i)  $P(A \cap B)$ ,  $P(A \cup B)$       (ii)  $P(A/B)$ ,  $P(B/A)$   
 (iii)  $P(A/C)$ ,  $P(C/A)$       (iv)  $P(B/C)$ ,  $P(C/A)$
16. Suppose A and B are independent events with  $P(A) = 0.6$ ,  $P(B) = 0.7$ . Then compute  
 (i)  $P(A \cap B)$       (ii)  $P(A \cup B)$       (iii)  $P(A/B)$       (iv)  $P(A^c \cap B^c)$
17. A problem in calculus is given to two students A and B whose chances of solving it are  $\frac{1}{3}$  and  $\frac{1}{4}$  respectively. Find the probability of the problem being solved if both of them try independently.
18. Three screws are drawn at random from a lot of 50 screws, 5 of which are defective. Find the probability of event that all 3 screws are non-defective assuming that the drawing is  
 (i) with replacement    (ii) without replacement.
19. The probability that a boy A will get a scholarship is 0.9 and that another boy B will get is 0.8. What is the probability that atleast one of them will get the scholarship.
20. If A, B are two events then show that  
 $P(A/B) \cdot P(B) + P(A/B^c) \cdot P(B^c) = P(A)$