

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

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|-------------|--|----|
| 1. a) | Define hardness of water. Give its classification and units. Explain the determination of total hardness of water by EDTA method | 8M |
| b) | Explain about coagulation. | 2M |
| (OR) | | |
| 2. a) | Discuss Permutit or Zeolite process for softening of hard water with neat sketch. | 6M |
| b) | Write the advantages ,disadvantages and limitations of Zeolite process | 4M |

UNIT-II

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|-------------|---|----|
| 3. a) | Define Chromophore and Auxochrome with suitable examples | 4M |
| b) | Explain the terms i) Hypsochromic shift ii) Hyperchromic shift. | 6M |
| (OR) | | |
| 4. a) | Define nuclear magnetic resonance Spectroscopy | 2M |
| b) | Explain chemical shift and spin-spin splitting | 8M |

UNIT-III

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|-------------|--|----|
| 5. a) | Distinguish addition and condensation polymerization with suitable examples | 5M |
| b) | Discuss preparation, properties and engineering applications of PVC polymer. | 5M |
| (OR) | | |
| 6. a) | Distinguish Thermoplastics from Thermosetting Plastics | 5M |
| b) | Explain preparation, properties and uses of Bakelite polymer | 5M |

UNIT-IV

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|-------------|---|----|
| 7. a) | Explain SN ¹ and SN ² mechanisms with examples. | 6M |
| b) | Define Elimination reactions(E1 and E2) | 4M |
| (OR) | | |
| 8. a) | Write the types of Organic reactions with suitable examples. | 4M |
| b) | Explain the reaction and mechanism of Pinacol-Pinacolone rearrangement. | 6M |

UNIT-V

- | | | |
|-------------|---|----|
| 9. a) | Explain the mechanism of rusting of iron in acidic environment with relevant chemical equations | 4M |
| b) | Discuss method of application on metals by Galvanizing process. | 6M |
| (OR) | | |
| 10. a) | Explain the principle and process of anodic and cathodic coating with neat sketch. | 4M |
| b) | Discuss method of application on metals by Tinning process. | 6M |

UNIT-VI

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|-------------|--|----|
| 11. a) | How do you convert solar energy into electricity using photovoltaic cell? Explain principle and method with a neat sketch. | 6M |
| b) | Define Renewable & Non-Renewable energy sources. | 4M |
| (OR) | | |
| 12. a) | Write a detailed account of Lead-Acid cell with respect to their construction, working principle of cell .Discuss discharging and charging reactions of cell.. | 8M |
| b) | Define Supercapacitors. | 2M |

ENGINEERING PHYSICS
(Mechanical Engineering)

Time: 3 Hours

Max Marks: 60

Answer ONE Question from each Unit

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UNIT-I

1. a) Show that for a simple harmonic oscillator, mechanical energy remains constant and it is proportional to the square of the amplitude. 8M
 - b) What are the characteristics of Simple Harmonic Oscillator? 2M
- (OR)
2. a) What are Damped oscillations? Derive and solve differential equation of damped harmonic oscillator? 8M
 - b) Distinguish between damped and forced oscillations? 2M

UNIT-II

3. a) What are the necessary conditions for obtaining interference of light? 2M
 - b) Derive the expressions for diameters of bright and dark rings in Newton's rings experiment. 8M
- (OR)
4. a) Describe the Fraunhofer diffraction pattern obtained with single slit. 8M
 - b) What are the differences between interference and diffraction? 2M

UNIT-III

5. a) Explain the Einstein's coefficients. 6M
 - b) Explain the characteristics of lasers. 4M
- (OR)
6. a) Distinguish between Spontaneous emission and stimulated emission. 2M
 - b) With suitable diagrams, explain the principle, construction and working of He-Ne laser. 8M

UNIT-IV

7. a) Draw the block diagram of fiber optic in **communication system** and explain the function of each block 6M
 - b) Explain the principle of an optical fiber. 4M
- (OR)
8. a) Obtain the mathematical expression for acceptance angle and numerical aperture. 8M
 - b) For an optical fiber fractional index change is 0.14 and refractive index of cladding is 1.3. Calculate refractive index of the core. 2M

UNIT-V

9. a) Explain the terms
i) Basis ii) Unit cell 2M
 - b) Show that FCC is most closely packed of the three cubic structures. 8M
- (OR)
10. a) What is primitive cell and how does it differ from unit cell? 2M
 - b) Describe BCC crystal structure and obtain expression for packing fraction. 8M

UNIT-VI

11. a) Explain the classification of magnetic materials on the basis of electron spin. 8M
 - b) Distinguish between soft and hard magnetic materials. 2M
- (OR)
12. a) Difference between type -I and type-II superconductors? 7M
 - b) Explain the critical parameters and their significance in superconductors. 3M

APPLIED PHYSICS**(Common to CSE, CSD, AIML, IT Branches)****Time: 3 Hours****Max Marks: 60**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1. a) Explain principle of superposition of waves. Can two independent monochromatic light sources be Coherent? Justify your answer. 6 M
- b) Why the central spot is dark in Newton's Rings experiment seen in reflected light? 4 M

(OR)

2. a) Summarize the theory of diffraction of light by single slit arrangement and write the conditions for maxima and minima. 7 M
- b) A plane of wavelength 5893\AA passes through a slit, which is 0.5 mm wide and forms a diffraction pattern on a screen on the focal plane of a lens of focal length 1m. Calculate the separation of the dark band on either side of the central maximum. 3 M

UNIT-II

3. a) Illustrate various requirements for the construction of laser. 6 M
- b) List the applications of Lasers in Scientific and Medical field. 4 M

(OR)

4. a) What are Einstein Coefficients? 2 M
- b) With the help of suitable diagrams, explain the construction and working of He-Ne laser. 8 M

UNIT-III

5. a) Define Numerical aperture, Acceptance angle of an optical fiber and write their expressions. 6 M
- b) Find out the Critical angle and Numerical Aperture (NA) of an optical fiber, if the refractive indices of core and cladding are 1.62 and 1.52. 4 M

(OR)

6. a) Explain the light guiding mechanism of an optical fibre. 4 M
- b) Distinguish between Stepped index fibers and Graded index fibers with necessary diagrams. 6 M

UNIT-IV

7. a) Calculate the de-Broglie wavelength of electron of energy 200 eV. 4 M
(Planck's Constant = 6.625×10^{-34} Js, Mass of the electron = 9.1×10^{-31} Kg and Charge of the electron = 1.6×10^{-19} C)
- b) State Heisenberg's uncertainty principle. Why uncertainty principle important for microscopic particles but significant in practical life? 6 M
- (OR)
8. a) Write the physical significance of wave function. 4 M
- b) Derive expression for energy of a free particle within a one dimensional potential box, of length "L". 6 M

UNIT-V

9. a) State and Prove Gauss law in electrostatics. 6 M
- b) Outline the significance of Faraday's laws of electromagnetic induction. 4 M
- (OR)
10. a) Recall the term magnetic field and elaborate the magnetic force on a current carrying coil. 6 M
- b) Write the applications of Maxwell's equations. 4 M

UNIT-VI

11. a) Describe Hall effect and derive expression for Hall coefficient for N-type semiconductor with neat diagram. 7 M
- b) The Hall coefficient of a specimen is $3.66 \times 10^{-4} \text{ m}^3 \text{C}^{-1}$. Its resistivity is $8.93 \times 10^{-3} \Omega \text{ m}$. Calculate the density and mobility of the charge carrier 3 M
- (OR)
12. a) What is a Semiconductor? Write the important applications of semiconductors? 3 M
- b) Discuss the dependence of Fermi level on carrier concentration and temperature in N-type semiconductor. 7 M

AR18

CODE: 18BST108

SET-2

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)**

I B.Tech II Semester Supplementary Examinations, July, 2023

CHEMISTRY

(Common to Civil, MECH, ECE Branches)

Time: 3 Hours

Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1. a) Write notes on ionisation energy and electron affinity. 5M
b) What is hybridisation? Describe the sp^2 and sp^3d^2 hybridisations with examples. 7M
- (OR)
2. a) Write the postulates of MOT. Explain the MO diagram of CO molecule. 6M
b) What is co-ordination number? Explain how it is related to geometry of a complex with suitable examples. 6M

UNIT-II

3. a) Describe the various types of electronic transitions with a neat diagram. 6M
b) What are the various vibrational modes in IR spectroscopy? Exemplify. 6M
- (OR)
4. a) Illustrate the various absorption and intensity shifts with suitable examples. 5M
b) Write short notes on (i) Coupling constant (ii) Finger print region. 7M

UNIT-III

5. a) Describe the construction and reactions of a SHE in determining pH of a solution. 6M
b) Discuss about any six factors that affect the rate of corrosion. 6M
- (OR)
6. a) What is Galvanic series? Illustrate its role in explaining galvanic corrosion. 6M
b) How does sacrificial anodic and impressed current Cathodic protection help in controlling corrosion? Explain with a neat diagram. 6M

UNIT-IV

7. a) Write the mechanisms involved in E_1 and E_2 reactions with suitable examples. 7M
b) Explain the mechanism involved in Pinacol-Pinacolone rearrangement. 5M
- (OR)
8. a) Define the following with an example: 6M
(i) Polymer (ii) Functionality (iii) Degree of polymerisation
b) Discuss the mechanism of co-ordination polymerisation using Zeigler-Natta catalyst 6M

UNIT-V

9. a) Write notes on concentrated solar power plants based on the three technologies. 6M
b) Describe the construction, working, reactions and uses of an alkaline battery. 6M
- (OR)
10. a) Compare super capacitors with batteries. Mention the advantages and limitations of super capacitors. 6M
b) Describe the construction, working and reactions involved in Lead acid-battery. 6M

AR18

CODE: 18BST106

SET-2

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)**

I B.Tech II Semester Supplementary Examinations, July, 2023

Applied Physics

(Common to EEE, CSE, IT Branches)

Time: 3 Hours

Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1. a) Explain why central ring in Newton ring is dark in reflected system. 4
- b) Describe Young's double slit experiment for demonstration of interference of light. 8

(OR)

2. a) What is diffraction? What are the differences between diffraction and interference? 4
- b) Explain the Fraunhofer diffraction due to single slit and give intensity pattern. 8

UNIT-II

3. a) Explain the construction of an optical fibre. 4
- b) Discuss the merits and demerits of single-mode and multimode fibres. 8

(OR)

4. a) What do you mean by the acceptance angle for an optical fibre? Show that it is related to the numerical aperture. 8
- b) An optical fibre has core and cladding refractive indices of 1.55 and 1.50, respectively. Calculate the numerical aperture and acceptance angle. 4

UNIT-III

5. a) Derive de Broglie wavelength for electrons accelerated through a potential difference of 'V' volts. 8
b) Calculate the wavelength associated with an electron having energy 2000 eV. 4

(OR)

6. a) Distinguish between Matter waves and Electromagnetic (EM) waves. 6
b) i) Mention the Planck's hypothesis of quantum theory ii) An electron is confined to a one dimensional potential box of length 2\AA . Calculate the energies corresponding to second and fourth quantum states (in eV). 6

UNIT-IV

7. a) Explain the Gauss's law applied in case of line charge and derive the expression for 'D' due to the infinite line charge 8
b) What are Maxwell's electromagnetic equations in differential forms? 4

(OR)

8. a) State and explain Gauss's law in magneto statics 4
b) State and explain Faraday's law and Lenz's law of electromagnetic induction 8

UNIT-V

9. a) What are direct and indirect band gap semiconductors? 4
b) Explain Hall effect and derive the expression for Hall coefficient. 8

(OR)

10. a) Show that Fermi energy level E_F lies slightly above the top of the valence band in a *P*-type semiconductor 8
b) The R_H of a specimen is $3.66 \times 10^{-4} \text{ m}^3 \text{ C}^{-1}$. Its resistivity is $8.93 \times 10^{-3} \text{ ohm-m}$. Find μ and n . 4