

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

<u>UNIT-I</u>		Marks	CO	Blooms Level
1.	a) Define principle of superposition? Derive the expression for wavelength of the source by using Newton's ring method.	10M	CO-1	BL-2
	b) In Newton's rings experiment the diameter of 5 th dark ring was 0.336 cm and that of 15 th dark ring was 0.590 cm. Calculate the radius of curvature of plano-convex lens if wavelength of light used is 5890 Å,	4M	CO-1	BL-3
(OR)				
2.	a) Discuss various types of polarization.	7M	CO-1	BL-2
	b) Write a short note on quarter and half wave plates,	7M	CO-1	BL-2
<u>UNIT-II</u>				
3.	a) Define the following terms: a) Unit cell, b) lattice parameter and c) Bravais lattices	8M	CO-2	BL-2
	b) Show that atomic packing fraction in case of SCC is 52 %	6M	CO-2	BL-2
(OR)				
4.	a) State Miller indices and write important features of Miller indices.	8M	CO-2	BL-3
	b) Explain Miller indices with an example	6M	CO-2	BL-2
<u>UNIT-III</u>				
5.	a) Explain electronic polarization and derive the expression for it.	8M	CO-3	BL-3
	b) Derive Clausius-Mosotti relation in dielectrics	6M	CO-3	BL-3
(OR)				
6.	a) Explain ferromagnetic hysteresis on the basis of domains.	7M	CO-3	BL-3
	b) Differentiate out between dia, para and ferro magnetic materials.	7M	CO-3	BL-2
<u>UNIT-IV</u>				
7.	a) Define deBroglie hypothesis? Show that the deBroglie wavelength for electron is found to be equal to $12.26/\sqrt{V}$ Å.	8M	CO-4	BL-2
	b) Illustrate the properties of matter waves.	6M	CO-4	BL-3
(OR)				
8.	a) Derive Schrodinger time independent wave equation.	10M	CO-4	BL-3
	b) Write two important demerits of classical free electron theory	4M	CO-4	BL-2
<u>UNIT-V</u>				
9.	a) Explain the classification of crystalline solids based on band gap	6M	CO-5	BL-2
	b) Explain drift and diffusion currents in semiconductors	8M	CO-5	BL-2
(OR)				
10.	a) Distinguish between intrinsic and extrinsic semiconductors	10M	CO-5	BL-2
	b) Draw the band diagrams of intrinsic, <i>p</i> -type and <i>n</i> -type semiconductors	4M	CO-5	BL-2

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

		Marks	CO	Blooms Level
<u>UNIT-I</u>				
1.	a) Interpret the geometry and hybridization of H ₂ O and BF ₃ with help of VSEPR theory.	8M	1	3
	b) Discuss salient features of Molecular orbital theory. Illustrate the MO diagram of N ₂ molecule.	6M	1	2
(OR)				
2.	a) Illustrate the MO diagram of CO molecule and determine its bond order.	8M	1	3
	b) Describe π molecular orbitals of Butadiene with neat sketch.	6M	1	2
<u>UNIT-II</u>				
3.	a) Explain (i) Chemical shift (ii) spin spin splitting	8M	2	2
	b) State and explain Beer Lamberts law.	6M	2	2
(OR)				
4.	a) Discuss about different types of stretching and bending vibrations in IR spectroscopy	8M	2	2
	b) Illustrate the components of UV Visible Spectrophotometer with neat diagram	6M	2	2
<u>UNIT-III</u>				
5.	a) Derive Nernst's equation for electrode potential and cell potential.	8M	3	2
	b) Describe construction and working of Calomel electrode.	6M	3	2
(OR)				
6.	a) Explain working and uses of Electrochemical sensors	8M	3	2
	b) Explain the working principle of H ₂ -O ₂ fuel cell with neat sketch and electrode reactions.	6M	3	2
<u>UNIT-IV</u>				
7.	a) Distinguish thermoplastics from thermosetting plastics	6M	4	4
	b) Explain the Preparation, properties and applications of Nylon 6,6	8M	4	2
(OR)				
8.	a) Distinguish addition polymerisation from condensation polymerisation.	8M	4	4
	b) Describe conducting polymers. Discuss the mechanism of conduction and applications of polyaniline.	6M	4	2
<u>UNIT-V</u>				
9.	a) Discuss the properties and industrial applications of superconductors	8M	5	2
	b) Discuss the properties and applications of carbon nanotubes	6M	5	2
(OR)				
10.	a) Distinguish p-type from n-type semiconductors.	8M	5	4
	b) Discuss the principle and mechanism of super capacitors and mention their applications.	6M	5	2

Time: 3 Hours**Max Marks: 70**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

		Marks	CO	BTL
1.	a) Explain the EDTA method for the estimation of the hardness of water. Discuss the principle and procedure with suitable chemical equations.	8M	1	2
	b) Differentiate between foaming and priming in boilers. What are the consequences of foaming and priming? Describe the methods to control or eliminate foaming and priming in a boiler.	6M	1	2

(OR)

2.	a) Explain the Ion-exchange process for softening of hard water with neat diagram.	8M	1	2
	b) Describe the estimation of dissolved oxygen method.	6M	1	2

UNIT-II

3.	a) Discuss about various types of absorption and intensity shifts in UV - visible spectroscopy with examples.	8M	2	2
	b) Explain the role of chromophores and auxochromes in absorption.	6M	2	2

(OR)

4.	a) Discuss the principle and instrumentation of IR spectroscopy.	8M	2	2
	b) Describe the significance of the fingerprint region in IR spectroscopy with examples.	6M	2	2

UNIT-III

5.	a) Derive Nernst's equation giving the EMF of a cell in terms of concentration of reactants and products of cell reaction.	8M	3	2
	b) Describe the Construction and working principle of Zinc-Air battery.	6M	3	2

(OR)

6.	a) Describe the mechanisms involved in: a) bimetallic corrosion and b) differential aeration corrosion, providing suitable examples to illustrate each process.	8M	3	2
	b) Illustrate the principle and process of corrosion control by cathodic protection method with neat diagram.	6M	3	2

UNIT-IV

7.	a) Explain the mechanism of chain growth polymerization using suitable chemical equations and examples.	8M	4	2
	b) Describe the ultimate analysis of coal.	6M	4	2

(OR)

8.	a) Distinguish between thermoplastics and thermosetting plastics.	8M	4	2
	b) Explain proximate and ultimate analysis of coal.	6M	4	2

UNIT-V

9.	a) Explain setting and hardening of Portland cement with chemical equations.	8M	5	2
	b) Give a brief account of Fibre reinforced composites. Write their engineering applications.	6M	5	2

(OR)

10.	a) Explain the classification, properties, and factors affecting the performance of refractory materials.	8M	5	2
	b) Discuss any three properties of lubricants with their importance.	6M	5	2

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

I B.Tech II Semester Supplementary Examinations, June, 2025

CHEMISTRY

(Common to Civil & 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) | Explain the Ion Exchange Process for softening of water. | 5M |
| | b) | Write a short note on Breakpoint Chlorination. | 5M |

(OR)

- | | | | |
|----|----|--|----|
| 2. | a) | Describe how to determine the total hardness of water using the EDTA method. | 5M |
| | b) | Explain the concepts of Sedimentation and Coagulation. | 5M |

UNIT-II

- | | | | |
|----|----|--|----|
| 3. | a) | Discuss the different types of stretching and bending vibrations in IR Spectroscopy. | 5M |
| | b) | Explain the following terms: | |
| | | i) Chemical Shift | 5M |
| | | ii) Coupling Constant | |

(OR)

- | | | | |
|----|----|--|----|
| 4. | a) | Describe the various types of electronic transitions in the UV-visible region. | 5M |
| | b) | Write a short note on the Fingerprint Region in IR Spectroscopy. | 5M |

UNIT-III

- | | | | |
|----|----|---|----|
| 5. | a) | Explain the preparation, properties, and engineering applications of PVC. | 5M |
| | b) | Differentiate between Addition Polymerization and Condensation Polymerization with suitable examples. | 5M |

(OR)

- | | | | |
|----|----|--|----|
| 6. | a) | Compare and contrast Thermoplastic and Thermosetting Polymers. | 5M |
| | b) | Explain any one moulding technique for thermoplastics with a neat diagram. | 5M |

UNIT-IV

- | | | | |
|----|----|--|----|
| 7. | a) | Describe the mechanistic pathways of unimolecular and bimolecular elimination reactions with examples. | 5M |
| | b) | Explain the reaction and mechanism of the Pinacol-Pinacolone Rearrangement. | 5M |

(OR)

- | | | | |
|----|----|--|----|
| 8. | a) | Write a short note on the Claisen Reaction. | 5M |
| | b) | Explain the SN1 and SN2 mechanisms with relevant examples. | 5M |

UNIT-V

- | | | | |
|----|----|--|----|
| 9. | a) | Explain the principle and process of corrosion control by Impressed Current Cathodic Protection with a neat diagram. | 5M |
| | b) | Describe the principle and process of Tinning with a neat diagram. | 5M |

(OR)

- | | | | |
|-----|----|---|----|
| 10. | a) | Explain the principle and process of Anodic and Cathodic Coating with a neat diagram. | 5M |
| | b) | Discuss the factors influencing the rate of corrosion. | 5M |

UNIT-VI

- | | | | |
|-----|----|--|----|
| 11. | a) | Provide a detailed explanation of the Lead-Acid Cell, including its construction and cell reactions. | 5M |
| | b) | Write a short note on Renewable and Non-Renewable Energy Sources. | 5M |

(OR)

- | | | | |
|-----|----|---|----|
| 12. | a) | Explain any five principles of Green Chemistry. | 5M |
| | b) | Describe how solar energy is converted into electricity using a Photovoltaic Cell, with a neat diagram. | 5M |

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

I B.Tech II Semester Supplementary Examinations, June, 2025

**ENGINEERING PHYSICS
(MECHANICAL ENGINEERING)**

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) What is the forced oscillations? 2
- b) Discuss the differential equation of a forced damped oscillator and obtain its solution. 8

(OR)

2. a) What is the sharpness of resonance? 2
- b) Derive a damped harmonic oscillator's differential equation of motion and find its critical damping conditions. 8

UNIT-II

3. a) Distinguish between Fresnel's and Fraunhofer diffraction 4
- b) Discuss the distribution of intensity due to Fraunhofer diffraction at a single slit with a neat sketch 6

(OR)

4. a) What is the interference of light? Explain how to determine the wavelength of a monochromatic light source using Newton's rings method. 8
- b) In Newton's rings experiment, the diameter of the 10th dark ring due to wavelength 600 nm in air is 0.5 cm. Find the radius of curvature of the lens. 2

UNIT-III

5. a) Write the characteristics of Laser light. 2
- b) What is the stimulated emission of radiation? Explain the construction and workings of the three-level solid-state laser(Ruby laser) with an energy level diagram. 8

(OR)

6. a) What are the Einstein's coefficients? Derive the relation between the probabilities of spontaneous and stimulated emissions in terms of Einstein's coefficients. 7
- b) Calculate the energy and momentum of a photon of a laser beam of wavelength 632.8 nm. 3

UNIT-IV

7. a) What is the principle of optical fibre? Derive the expression for acceptance angle and numerical aperture in optical fibre 7
- b) Write the applications of optical fibres. 3

(OR)

8. a) The refractive index of the core and cladding are 1.55 and 1.53 respectively. Calculate the acceptance angle and numerical aperture of an optical fibre. 4
- b) Explain the advantages of optical fibres in communication over conventional communication systems. 6

UNIT-V

9. a) Define the terms: i) Crystalline and ii). Amorphous solid 2
- b) What is the coordination number? Obtain the expression for the packing factor of the BCC structure 8

(OR)

10. a) Define the unit cell and primitive cell. Draw the schematic diagrams of SC, BCC and FCC crystals 7
- b) The atomic radius of copper is 1.278 Å. It has an atomic weight of 63.54. Find the density of the copper. 3

UNIT-VI

11. a) Distinguish between soft and hard magnetic materials with suitable examples. 8
- b) What is the B-H curve in ferromagnetic materials? 2

(OR)

12. a) Explain the phenomenon of superconductivity in superconductors. 4
- b) Distinguish between Type-I and Type-II superconductors with suitable examples. 6

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

I B. Tech II Semester Supplementary Examinations, June, 2025

APPLIED PHYSICS

(Common to CSE, CSE(AIML), CSE(DS) & 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 the principle of superposition of waves 3
- b) Obtain the expression for diameter of the n^{th} dark ring in the case of Newton's rings. 7

(OR)

2. a) What is diffraction? Explain clearly the difference between interference and diffraction. 5
- b) Mention the types of diffraction and give the differences between them. 5

UNIT-II

3. a) Describe the construction and working of a ruby laser. 7
- b) Explain the purpose of an active medium in a laser. 3

(OR)

4. Define Absorption, spontaneous and stimulated emissions? Derive the relation between the probabilities of spontaneous emission and stimulated emission in terms of Einstein's coefficient. 10

UNIT-III

5. a) Distinguish between the light propagation in a step index fiber and in a graded index fiber. 6
- b) What are the conditions to produce total internal reflection in optical fiber 4

(OR)

6. a) Define Acceptance angle. derive expressions for it. 7
- b) Calculate acceptance angle for an optical fiber with core and cladding refractive indices being 1.48 and 1.45 respectively. 3

UNIT-IV

7. Solve the Schrodinger wave equation for a particle confined in a one dimensional potential of width 'L' and infinite height. Obtain an expression for its energy and wave function. 10

(OR)

8. a) State and explain Heisenberg uncertainty principle. 4
- b) Derive the time dependent Schrodinger's wave equation 6

UNIT-V

9. a) State the Maxwell's equations in integral form. 4
- b) State and explain Ampere's Law. 6

(OR)

10. Define electric field intensity. With the application of Gauss law obtain an expression for electric field intensity at a point which is at a distance 'R' from a point charge Q. 10

UNIT-VI

11. a) Distinguish between Intrinsic and Extrinsic semiconductors with suitable examples. 4
- b) Derive an expression for the density of holes in the valence band of an intrinsic semiconductor 6

(OR)

12. Explain Hall effect and obtain an expression for Hall coefficient and also discuss the importance of Hall effect. 10

AR18

CODE: 18BST108

SET-1

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

I B.Tech II Semester Supplementary Examinations, June, 2025

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) Explain shapes of following molecules with the help of VSEPR theory. i) H_2O ii) XeF_2 8M
b) Draw the Molecular Orbital Energy Level diagram of O_2 –molecule 4M
- (OR)
2. a) Explain the variation of Atomic and ionic sizes across the groups and periods in a periodic table 6M
b) Explain the following with examples. i) sp^2 hybridization ii) sp^3 hybridization 6M

UNIT-II

3. a) Define fluorescence and phosphorescence with help of Jablonski diagram 6M
b) Discuss Finger print region in IR spectroscopy 6M
- (OR)
4. a) Discuss the principle of NMR spectroscopy 6M
b) Define Chemical Shift in NMR and explain its consequences 6M

UNIT-III

5. a) Discuss about the electrochemical series and its importance 6M
b) Discuss the Factors effecting the rate of corrosion 6M
- (OR)
6. a) Describe the construction and working of i) standard hydrogen electrode 6M
ii) calomel electrode
b) Explain the following i) sacrificial anodic protection ii) impressed current cathodic protection 6M

UNIT-IV

7. a) Define isomerism and explain about cis – trans isomerism with suitable examples 6M
b) Explain SN^1 and SN^2 mechanisms with examples. 6M
- (OR)
8. a) Explain addition polymerizations with suitable examples. 6M
b) Discuss the various classifications of polymers with suitable examples 6M

UNIT-V

9. a) Define green chemistry and explain any six principles of it. 6M
b) What are photovoltaic cells and explain their role in making solar energy into current 6M
- (OR)
10. a) Explain the construction, working and cell reactions of Lead-Acid battery 6M
b) Discuss the difference between Batteries and Super capacitors. 6M

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) Describe the principle and formation of Newton's rings with neat diagram and give a method to determine wavelength of monochromatic light. 8 M
- b) Explain the reason for formation of circular rings in Newton's rings experiment. 4 M
- (OR)
2. a) Discuss Fraunhofer diffraction due to single slit. Derive the conditions for central maximum, minima and secondary maxima of single slit diffraction pattern. From this, obtain intensity distribution curve. 8 M
- b) Distinguish between interference and diffraction. 4 M

UNIT-II

3. a) Explain different types of optical fibers. 6 M
- b) Discuss the various applications of optical fibers. 6 M
- (OR)
4. a) Discuss about acceptance angle and numerical aperture of an optical fiber. 7 M
- b) Calculate the refractive indices of core and cladding material of a fiber having numerical aperture 0.22 and fractional refractive index change 0.012. 5 M

UNIT-III

5. a) Derive Schrödinger time independent wave equation 7 M
- b) An electron is bound in one dimensional infinite well of width 1×10^{-10} m. Find the energy value of an electron in the ground state and first two excited states. (Ground state $n=1$, first and second excited states are $n=2$ and $n=3$) 5 M
- (OR)
6. a) Derive Schrödinger wave equation for an electron in one dimensional potential well and explain variation of its energy levels 8 M
- b) Describe Heisenberg's uncertainty principle 4 M

UNIT-IV

7. a) State and explain Maxwell's equations in integral form for electromagnetic fields. 8 M
- b) Deduce the relation between electric potential and electric field. 4 M
- (OR)
8. a) State and explain Faraday's law 6 M
- b) Explain Biot-Savart law. 6 M

UNIT-V

9. a) Explain Hall effect. Derive expression for Hall coefficient of p-type semiconductors. Discuss the applications of Hall effect. 8 M
- b) Derive the expression for intrinsic electrical conductivity. 4 M
- (OR)
10. a) Explain direct and indirect bandgap semiconductors. 8 M
- b) Explain the temperature dependence of Fermi level in p-type semiconductor 4 M

AR16

CODE: 16BS1004

SET-I

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

I B.Tech II Semester Supplementary Examinations, June, 2025

**ENGINEERING CHEMISTRY
(Common to ECE, CSE & IT Branches)**

Time: 3 Hours

Max Marks: 70

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 Discuss various types of polymerization with suitable examples. 6M
b Define polymer, monomer, degree of polymerization and functionality. 8M
- (OR)
2. a With suitable chemical reactions explain setting and hardening of cement. 6M
b Explain various chemical constituents of Portland cement. Write their functions. 8M

UNIT-II

3. a Describe the estimation of total hardness of water by EDTA method. 8M
b With a neat sketch discuss zeolite process. 6M
- (OR)
4. a What are various disinfection methods of water? Explain any two methods. 7M
b Discuss anyone method of desalination of brackish water. 7M

UNIT-III

5. a How proper design of machine can control corrosion? Explain. 6M
b Explain the mechanism of electrochemical corrosion. 8M
- (OR)
6. a Discuss various cathodic protection methods for corrosion control. 8M
b Explain (i) galvanic corrosion (ii) pitting corrosion. 6M

UNIT-IV

7. a Define and explain octane and cetane number. Write their significance. 8M
b Explain the preparation of synthetic petrol by Bergius process. 6M
- (OR)
8. a Define lubricant. Explain its functions. 6M
b Define flash point, fire point, cloud point and pour point. 8M

UNIT-V

9. a Derive Nernst equation for single electrode potential. 6M
b Explain construction and working of photovoltaic cell. 8M
- (OR)
10. a What is electrochemical series? Write its significance. 8M
b Describe the construction, working and applications of calomel electrode. 6M