

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) Illustrate the process to estimate the concentration of dissolved oxygen in water and methods, principles, and significance involved in the measurement. Provide a detailed explanation of the steps involved, the chemical reactions (if any), and the interpretation of the results. | 8M | 1 | 2 |
| b) Explain the process of desalination of brackish water using the reverse osmosis (RO) method. Discuss the principle, working, Advantages and limitations of using RO for desalination. | 6M | 1 | 2 |

(OR)

- | | | | |
|--|----|---|---|
| 2. a) Discuss the causes, treatment methods of various boiler troubles such as priming, foaming, scale, and sludge formation with suitable chemical reactions. | 8M | 1 | 2 |
| b) Illustrate the process to estimate the concentration of hardness of water by EDTA method, principles, and significance involved in the measurement. Provide a detailed explanation of the steps involved, the chemical reactions (if any), and the interpretation of the results. | 6M | 1 | 2 |

UNIT-II

- | | | | |
|---|----|---|---|
| 3. a) Discuss the principle, working, Advantages and limitations of UV-Visible spectroscopy using a neat sketch. | 8M | 2 | 2 |
| b) Explain Beer-Lambert's Law and derive its mathematical expression. Discuss the significance of each term involved and describe how this law is applied in determining the concentration of a solution using spectrophotometry. | 6M | 2 | 2 |
- (OR)**
- | | | | |
|--|----|---|---|
| 4. a) Explain the following terms with suitable examples: Principle of NMR, Chemical shift, splitting pattern and Coupling constant. | 8M | 2 | 2 |
| b) Differentiate between equivalent and non-equivalent protons in NMR spectroscopy with examples. | 6M | 2 | 2 |

UNIT-III

5. a) Discuss the working principle, construction, and chemical reactions involved in the operation of lithium-ion battery using a neat sketch. 8M 3 2
- b) Describe the chemical theory of corrosion in detail, along with an explanation of its various types, supported by suitable examples. 6M 3 2

(OR)

6. a) Explain the principle, construction, and working of a hydrogen-oxygen fuel cell with suitable chemical reactions and a neat sketch. 8M 3 2
- b) Describe how the nature of the metal and the characteristics of the environment influence the rate of corrosion, providing suitable examples to illustrate these effects. 6M 3 2

UNIT-IV

7. a) Discuss the preparation, properties, and applications of Bakelite. 8M 4 2
- b) Explain the terms HCV and LCV. Discuss the calculation of HCV and LCV for a given sample. 6M 4 2

(OR)

8. a) Discuss the classification of polymers based on their thermal behaviour. Provide examples of each and explain their distinct characteristics. 8M 4 2
- b) Explain the significance of octane and cetane numbers in determining the quality of fuels. 6M 4 2

UNIT-V

9. a) Define composites and explain their classification based on the type of reinforcement with suitable examples. 8M 5 2
- b) Explain the mechanism and functions of lubricants. 6M 5 2

(OR)

10. a) Explain the setting and hardening of Portland cement with chemical equations. 8M 5 2
- b) Explain the classification and Physico-chemical properties of refractories. 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

		Marks	CO	Blooms Level
UNIT-I				
1.	a) Explain the non linear shape of H_2S and non planar shape of PCl_3 using valence shell electron pair repulsion theory.	8M	CO1	L5
	b) Explain the π - molecular orbital structure of benzene.	6M	CO1	L5
(OR)				
2.	a) Using molecular orbital theory, compare the bond energy and magnetic character of N_2 and O_2 molecules.	8M	CO1	L3
	b) Calculate the bond order of CO and NO molecules using MO Theory.	6M	CO1	L3
UNIT-II				
3.	a) State Beer-Lambert's law and write importance and limitations of Beer-Lambert's law	8M	CO2	L1
	b) Discuss about chemical shifts with examples.	6M	CO2	L2
(OR)				
4.	a) Discuss UV spectra arise from absorption by electronic transitions. Explain this phenomenon with examples.	8M	CO2	L2
	b) Write note on fundamental modes in IR spectroscopy.	6M	CO2	L1
UNIT-III				
5.	a) Derive Nernst equation and Explain its significance to determine EMF of a cell.	8M	CO3	L3
	b) What are Fuel cells? Explain construction and working of any one fuel cell with neat diagram.	6M	CO3	L1
(OR)				
6.	a) How do you estimate Iron (II) with $\text{K}_2\text{Cr}_2\text{O}_7$ potentiometrically? Explain.	8M	CO3	L1
	b) Explain construction and working of Zn-air battery with neat diagram.	6M	CO3	L2
UNIT-IV				
7.	a) Differentiate thermoplastic and thermo setting resins.	8M	CO4	L4
	b) Describe the preparation, properties of Buna-S and Buna-N.	6M	CO4	L2
(OR)				
8.	a) What are conducting polymers? Explain conducting mechanism of poly acetylene and write applications.	8M	CO4	L1
	b) Distinguish between chain growth and step growth polymerization.	6M	CO4	L4
UNIT-V				
9.	a) Explain the basic concept and properties of Super conductors of $\text{YBa}_2\text{Cu}_3\text{O}_7$ by Ceramic Method.	8M	CO5	L2
	b) Write short notes on Fullerenes.	6M	CO5	L1
(OR)				
10.	a) Illustrate the principle and mechanism of Supercapacitors with neat sketch.	8M	CO5	L4
	b) Analyze Carbon Nano tubes and Graphene Nano particles.	6M	CO5	L4

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) What is thin film? Explain colours in thin films.	6M	CO1	II
	b) How are Newton's Rings formed? Describe Newton's Rings Experiment to determine the wavelength of monochromatic light with necessary theory.	8M	CO1	II
(OR)				
2.	a) Distinguish between single slit and double slit diffraction patterns.	7M	CO1	III
	b) Illustrate the fabrication and working of a Nicol Prism.	7M	CO1	II
<u>UNIT-II</u>				
3.	a) Prove that FCC structure is closely packed with atoms than BCC and SC structures.	8M	CO2	III
	b) Sketch the planes for the Miller indices: (101) (110) (111)	6M	CO2	III
(OR)				
4.	a) Why X-rays used for crystal diffraction studies? X-rays of wave length 1.5\AA make a glancing angle 60° in the first order when diffracted from NaCl crystal. Find the lattice constant of NaCl.	6M	CO2	III
	b) Demonstrate Laue method and also the usefulness of this method.	8M	CO2	II
<u>UNIT-III</u>				
5.	a) Outline the significance of polarizability and dielectric constant of a material. How these two parameters are related with each other.	6M	CO3	IV
	b) Explain the concept of Internal field in a dielectric material.	8M	CO3	III
(OR)				
6.	a) Categorize dia, para and ferromagnetic materials.	7M	CO3	II
	b) Draw the hysteresis curve and write its significance.	7M	CO3	IV
<u>UNIT-IV</u>				
7.	a) Heisenberg's uncertainty principle is significant only for subatomic particles and not for heavy bodies – justify.	4M	CO4	IV
	b) Derive the expression for Schrodinger's time dependent wave equation and discuss the physical significance of wave function.	10M	CO4	III
(OR)				
8.	a) Compare the salient features of classical free electron theory with Quantum free electron theory.	8M	CO4	II
	b) Derive the expression for electrical conductivity based on free electron theory.	6M	CO4	III
<u>UNIT-V</u>				
9.	a) Classify Intrinsic and Extrinsic semiconductors with suitable examples and energy level diagrams.	8M	CO5	II
	b) Derive the expression for density of electrons in the conduction band of an intrinsic semiconductor.	6M	CO5	III
(OR)				
10.	a) Analyze drift and diffusion currents in a semiconductor with relevant expressions and develop Einstein equation.	8M	CO5	III
	b) State and explain the significance of Hall effect.	6M	CO5	II

Time: 3 Hours

Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

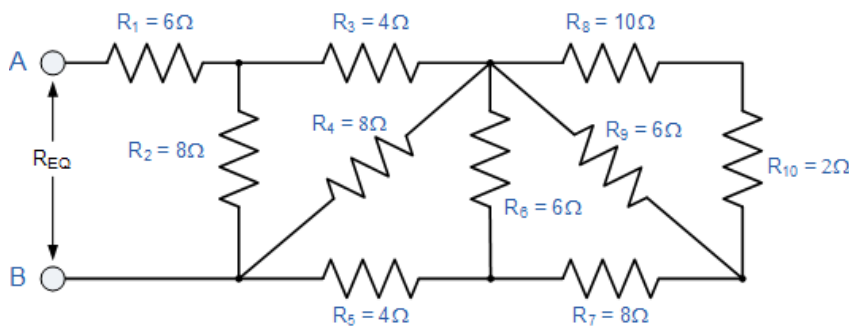
All parts of the Question must be answered at one place

UNIT-I

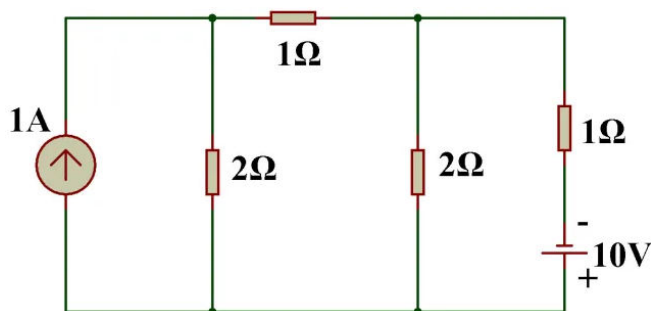
1. a) Define Ohm's law and explain with an example 4M
- b) Define the following (i) Passive element (ii) Lumped network (iii) Bilateral element with examples 6M

(OR)

2. a) Calculate the equivalent resistance across the terminals AB in the circuit shown below 10 M

**UNIT-II**

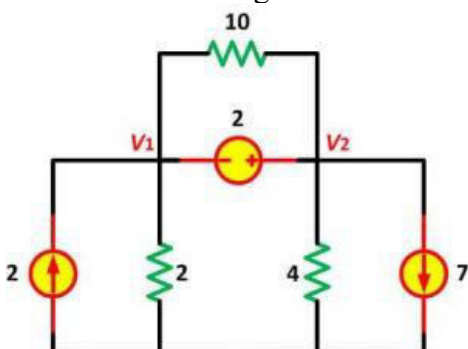
3. a) Use Mesh analysis to calculate the current through 10V source 5M



- b) Three resistors 3Ω each are connected in delta. Transform the network into equivalent star network. 5M

(OR)

4. a) Find the node voltages 5M



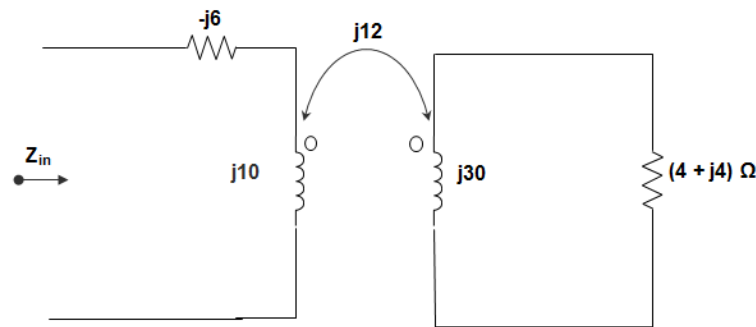
- b) Derive the transformation of a star network to delta network 5M

UNIT-III

5. A series RL circuit with $R = 100 \Omega$ and $L = 3 \text{ mH}$ is connected to a 230 V RMS , 50 Hz supply. Determine the circuit current, the resistor voltage, the capacitor voltage and the phase angle of the current with respect to the supply voltage. 10M
- (OR)
6. Define the following (i) RMS value (ii) Average Value (iii) Active Power (iv) Reactive Power (v) Power factor 10M

UNIT-IV

7. Calculate the value of input impedance for the circuit shown below 10M



(OR)

8. a) Define the following i) reluctance ii) magneto motive force iii) magnetic field intensity 6M
- b) Compare between magnetic and electrical circuits. 4M

UNIT-V

9. a) Explain the construction of a DC machine with a neat diagram. 6M
- b) Discuss the applications of DC shunt generator 4M
- (OR)
10. a) Classify the DC generators based on the connection of their windings with a neat sketch 6M
- b) Explain the internal and external characteristics of a DC shunt generator 4M

UNIT-VI

11. a) Explain the principle operation of DC Motor with neat sketch 6M
- b) Discuss various applications of DC motors 4M
- (OR)
12. Explain the various speed control methods of DC Motors 10M

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)****I B. Tech II Semester Supplementary Examinations, August - 2025****Programming for Problem Solving
(Common to Civil, ECE & EEE 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) Define an algorithm and explain the characteristics of a good algorithm. **5M**
b) Write a C program to find the largest among three numbers using if-else. **5M**

(OR)

2. a) Write a C program to demonstrate operator precedence in arithmetic and logical operations. **5M**
b) Draw a flowchart to check if a number is prime. **5M**

UNIT-II

3. a) Write a C program to reverse a number using a loop. **5M**
b) Explain the significance of break and continue statements in loop execution. **5M**

(OR)

4. a) Explain the different decision-making statements in C with syntax and examples. **5M**
b) Write a C program to generate prime numbers between two given numbers. **5M**

UNIT-III

5. a) Explain how to declare, initialize, and access elements of a one-dimensional array. **5M**
b) Write a C program to check whether two matrices are equal. **5M**

(OR)

6. a) Differentiate between static memory allocation and dynamic memory allocation. **5M**
b) Write a C program to find the largest element in an array. **5M**

UNIT-IV

7. a) Explain the different types of function parameters with examples. **5M**
b) Write a C program to swap two numbers using call by reference. **5M**

(OR)

8. a) Explain the difference between local and global variables with an example. **5M**
b) Write a C program to calculate the power of a number using recursion. **5M**

UNIT-V

9. a) Explain how structures are passed to functions with an example. **5M**
b) Write a C program to store and display employee details using structures. **5M**

(OR)

10. a) Describe the difference between accessing structure members using dot (.) and arrow (->) operators. **5M**
b) Write a C program to compare two dates using structures. **5M**

UNIT-VI

11. a) Explain the concept of macros with an example. **5M**
b) Write a C program to read a file and display its contents on the screen. **5M**

(OR)

12. a) Explain different file opening modes in C. **5M**
b) Write a C program to append data to an existing file. **5M**

AR18

CODE: 18BST106

SET-1

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

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

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) 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. 9 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. 3 M

UNIT-III

5. a) Derive Schrödinger time independent wave equation 9 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. (Ground state $n=1$) 3 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, August - 2025

**Engineering Chemistry
(Common for 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 for softening of hard water. 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

AR16

CODE: 16BS1003

SET-I

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

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

Engineering Physics

(Common to Civil, EEE & MECH 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 Write the necessary theory to determine the radius of curvature of lens using Newton's rings method. 10
- B In Newton's rings experiment the diameter of 8th ring was found to be 0.350 cm and that of 18th ring 0.650 cm. If the wavelength of light 6000 Å is used then find the radius of curvature of the Plano-convex lens. 4
- (OR)
2. a Distinguish between interference and diffraction. 4
- b Discuss in detail Fraunhofer diffraction due to single slit with energy distribution Curve. 10

UNIT-II

3. a Explain the characteristics of laser beam. 4
- b Explain the construction and working principle of He-Ne laser with a neat diagram. 10
- (OR)
4. a Explain the principle of optical fibre with neat diagram. 6
- b Derive an expression for acceptance angle and numerical aperture of optical fibre. 8

UNIT-III

5. a Write the properties of de-Broglie matter waves and Derive the expression for de-Broglie wave length 7
- b Derive the Schrödinger time dependent wave equations. 7
- (OR)
6. a Derive the Eigen values of free particle in one dimensional box. 10
- b Calculate the de-Broglie wavelength of an electron moving with velocity 10^9 m/sec. ($m_e = 9.11 \times 10^{-31}$ Kg). 4

UNIT-IV

7. a Derive the relation between B, H, I and μ_r, χ 4
- b Write the properties of dia, Para and Ferromagnetic materials. 10
- (OR)
8. a Explain the hysteresis loop with neat graphical diagram, observed in ferromagnetic materials. 10
- b Distinguish between Soft and Hard magnetic materials with neat diagram. 4

UNIT-V

9. a Explain Dielectrics in external field with neat diagram. 6
- b Explain in detail, the phenomenon of ferroelectric hysteresis 8
- (OR)
10. a Derive the relation between D, E and P 4
- b Explain the electronic polarizability in atoms and Obtain an expression for electronic polarizability in terms of radius of the atom. 10