R25 Regulation *Subject code:5BS1AL*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech I Semester Supplementary Examinations, June 2026

ADVANCED ENGINEERING PHYSICS

(Common to CSE & CSE(AI&ML))

Maximum Marks: 60 Date:23.06.2026 Duration: 3 hours

Note: **1.This question paper contains two parts A and B.**
2. Part A is compulsory which carries 10 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (5X2M=10Marks)		Marks	CO	BTL
1.a	Define eigen values and eigen functions.	2M	1	2
b	Draw the crystal planes with Miller indices (110) and (001).	2M	2	2
c	Why is linear algebra important in quantum computation?	2M	3	2
d	Define Magnetic induction.	2M	4	3
e	Mention any two types of losses in optical fibers.	2M	5	3

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
2	Derive the time-independent Schrödinger equation and discuss physical significance of wave function.	10M	1	3
	OR			
3	a) Using E–k diagrams, explain qualitatively how a periodic potential lead to the splitting of energy levels in the Kronig–Penney model. b) With the help of band structure diagrams, explain the differences between conductors, semiconductors, and insulators according to band theory.	5M 5M	1	4 2
4	a) Explain the concept of unit cell, space lattice, and basis. b) Obtain the expressions for the atomic packing factor of SC, BCC, and FCC structures and discuss their comparative packing factors.	3M 7M	2	2 3
	OR			
5	Derive Bragg's law and powder method for X-ray diffraction.	10M	2	3
6	a) Define Hilbert space and explain its significance in quantum mechanics and quantum computing.	5M	3	2

	b) Compare classical bits and qubits.	5M		4
	OR			
7	a) Explain the concept of quantum entanglement and discuss its significance and applications in quantum information processing. b) Describe Grover's search algorithm using a quantum circuit and discuss its efficiency in comparison with classical algorithms.	3M 7M	3	4 4
8	a) Classify magnetic materials into diamagnetic, paramagnetic, and ferromagnetic types and give suitable examples for each. b) Differentiate between soft and hard magnetic materials. Mention their important applications.	5M 5M	4	2 4
	OR			
9	a) Explain the electonic polarization in dielectrics with suitable examples. b) Discuss the applications of ferroelectric, piezoelectric, and pyroelectric materials with suitable examples.	7M 3M	4	2 3
10	a) Explain the concepts of metastable state, population inversion, and pumping. Discuss their role in achieving laser action. b) Describe the construction and working of a Ruby laser with a neat energy level diagram. Mention its applications.	5M 5M	5	2 3
	OR			
11	a) Derive the expression for numerical aperture and acceptance angle in an optical fiber. b) Differentiate between single-mode and multi-mode fibers based on mode of propagation.	7M 3M	5	3 2