Code No: 151AB **R18**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech I Year I Semester Examinations, January/February - 2024
ENGINEERING PHYSICS
(Common to CE, ME, MCT, MMT, AE, MIE, PTM)

Time: 3 Hours **Max. Marks: 75**

Note: i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A
(25 Marks)

1.a)	List the four fundamental forces in nature.	[2]
b)	A 1 kg ball is thrown upwards with an initial speed of 10 m/s. Find the maximum height it reaches.	[3]
c)	A mass-spring system has a mass of 0.5 kg and a spring constant of 200 N/m. Calculate the natural frequency of the system.	[2]
d)	What are some key applications of harmonic oscillators?	[3]
e)	Calculate the speed of a wave in a string with a tension of 20 N and a linear density of 0.1 kg/m.	[2]
f)	Find the fundamental frequency of a standing wave in a string of length 2m, tension 50 N, and mass 0.5 kg.	[3]
g)	In a Michelson interferometer, what happens to the interference pattern when one of the mirrors is moved slightly?	[2]
h)	Two waves traveling in the same medium have amplitudes 2 cm and 3 cm. What is the maximum and minimum resultant amplitude?	[3]
i)	What is the role of the pumping source in a laser?	[2]
j)	Define coherence in the context of electromagnetic waves.	[3]

PART - B
(50 Marks)

2.a)	Discuss the challenges and methods of solving Newton's equations of motion in spherical coordinates.	
b)	How does friction alter the equations of motion?	[5+5]

OR

3.a)	Compare and contrast gravitational force and electromagnetic force?	
b)	Can Newton's second law be form-invariant in non-inertial frames? Discuss in detail.	[5+5]
4.a)	What are the similarities and differences between mechanical and electrical oscillators?	
b)	How does energy decay over time in a damped harmonic oscillator, and what factors influence this decay?	[5+5]

OR

5.a) What characterizes heavy damping in a damped harmonic oscillator, and how does it affect the system's response?

b) How does an electrical simple harmonic oscillator work, and what are its primary components? [5+5]

6.a) Write a note on impedance matching.

b) Derive the equation for the velocity of transverse waves along a stretched string. [5+5]

OR

7.a) How are standing sound waves formed and what are their unique characteristics?

b) What distinguishes longitudinal waves from transverse waves in terms of particle motion and wave propagation? [5+5]

8.a) Explain Huygen's Principle and how it applies to the propagation of light waves.

b) Explain the formation of Newton's rings and their use in determining the wavelength of light. [5+5]

OR

9.a) Discuss the working principle and construction of Michelson's Interferometer.

b) What is the principle behind the Mach-Zehnder Interferometer, and how is it used to measure small changes in the refractive index? [5+5]

10.a) What is population inversion in laser physics, and why is it crucial for laser operation?

b) Describe the principle of total internal reflection in the context of optical fibers. [5+5]

OR

11.a) Differentiate between step index and graded index fibers. What are the advantages and disadvantages of each type?

b) Discuss the various types of losses associated with optical fibers. [5+5]

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