

R18

Code No: 151AB

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



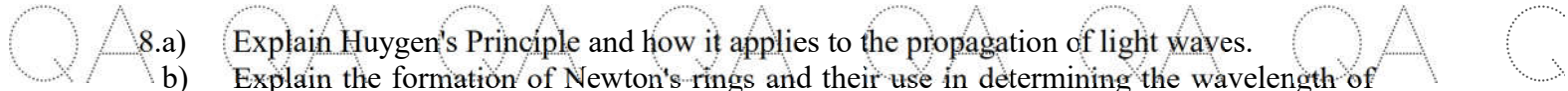
- 5.a) What characterizes heavy damping in a damped harmonic oscillator, and how does it affect the system's response?
- b) How does an electrical simple harmonic oscillator work, and what are its primary components? [5+5]



- 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

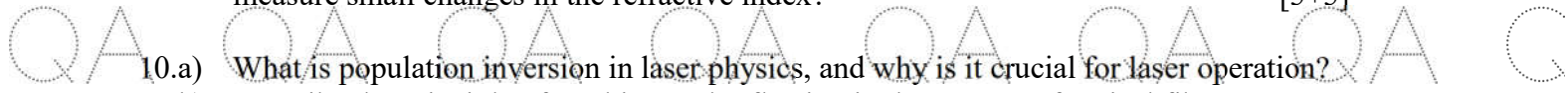
- 7.a) How are standing sound waves formed and what are their unique characteristics?
- b) What distinguishes longitudinal waves from transverse waves in terms of particle motion and wave propagation? [5+5]



- 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

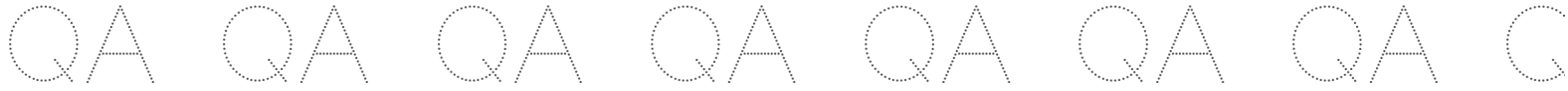
- 9.a) Discuss the working principle and construction of Michelson's Interferometer.
- b) What is the principle behind the Mach-Zehnder Interferometer, and how is it used to measure small changes in the refractive index? [5+5]



- 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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