

R18

Code No: 151AB

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech I Year I Semester Examinations, December – 2019/January - 2020

ENGINEERING PHYSICS

(Common to CE, ME, MCT, MMT, AE, MIE, PTM)

Time: 3 hours

Max. Marks: 75

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART- A

(25 Marks)

- 1.a) What are the different types of forces in nature? [2]
- b) Explain simple harmonic motion. Explain the term phase of a simple harmonic oscillator. [2]
- c) Write the characteristics of transverse waves. [2]
- d) Write the principle of superposition of waves. [2]
- e) What is population inversion in a laser? How it is achieved? [2]
- f) Discuss the types of friction. [3]
- g) What are the characteristic elements of a mechanical oscillator? Give their electrical equivalent. [3]
- h) A tuning fork of frequency 1000Hz produces a wave of wavelength 20 cm in air. Calculate the velocity of sound in air. [3]
- i) There are 15000 lines per inch in a grating. What is the maximum number of orders obtained by using light of wavelength 6000\AA ? [3]
- j) The refractive indices of core and cladding of a step index optical fibre are 1.563 and 1.498 respectively. Calculate the numerical aperture. [3]

PART - B

(50 Marks)

- 2.a) Derive the expression of $F=ma$, in polar coordinates.
- b) Two particles of masses m_1 and m_2 are interconnected by a light inextensible string which passes over the smooth pulley. If the system is released the particles move. Find the tension in the string? [5+5]

OR

- 3.a) Obtain rotation matrix of a vector in three dimension.
- b) A 30Kg block is to be moved up an inclined plane at an angle 30° to the horizontal with a velocity 5ms^{-1} . If the frictional force retarding the motion is 150N. Find the horizontal force required to move the block up the plane ($g=10\text{ms}^{-2}$). [5+5]

- 4.a) Solve the differential equation of a damped harmonic oscillator.
- b) Investigate the conditions under which the oscillations are said to be under damped, over damped. [5+5]

OR

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- 5.a) Obtain the expressions for mechanical impedance and electrical impedance.
b) Show that the power absorbed by a driven oscillator from the driving force is maximum at velocity resonance. [5+5]

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- 6.a) Obtain the general wave equation on a string.
b) Discuss the phenomena of reflection and transmission of transverse wave at the boundary. [5+5]

OR

- 7.a) Obtain Eigen frequencies for standing waves in strings.
b) Explain the production of standing waves in open pipe and obtain over tone frequencies. [5+5]

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- 8.a) Describe Young's double slit experiment.
b) Explain the formation of Newton's rings. Deduce the conditions for bright and dark fringes. [5+5]

OR

- 9.a) Describe the theory and construction and working of Mah-Zehnder interferometer.
b) Explain with theory the Fraunhofer diffraction due to a single slit and deduce the position of minima and maxima. [5+5]

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- 10.a) Explain with neat diagram the principle and working of a ruby laser.
b) Write the medical applications of lasers. [5+5]

OR

- 11.a) Distinguish between step index and graded index fibres with the help of refractive index profule.
b) Explain the advantages of optical fibre communication. [5+5]

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