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.

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] [2] Write the characteristics of transverse waves. c) d) Write the principle of superposition of waves. [2] What is population inversion in a laser? How it is achieved? [2] e) Discuss the types of friction. [3] f) What are the characteristic elements of a mechanical oscillator? Give their electrical **g**) equivalent. [3] A tuning fork of frequency 1000Hz produces a wave of wavelength 20 cm in air. h) Calculate the velocity of sound in air. [3]

- There are 15000 lines per inch in a grating. What is the maximum number of orders i) obtained by using light of wavelength  $6000 \text{A}^{0}$ ? [3]
- The refractive indices of core and cladding of a step index optical fibre are 1.563 and j) 1.498 respectively. Calculate the numerical aperture. [3]

# PART - B

(50 Marks)

- 2.a) Derive the expression of F = ma, in polar coordinates.
- Two particles of masses m<sub>1</sub> and m<sub>2</sub> are interconnected by a light inextensible string which b) passes over the smooth pulley. If the system is released the particles move. Find the tension in the string? [5+5]

#### OR

- Obtain rotation matrix of a vector in three dimension. 3.a)
  - A 30Kg block is to be moved up an inclined plane at an angle  $30^{\circ}$  to the horizontal with a b) velocity 5ms<sup>-1</sup>. 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.
- Investigate the conditions under which the oscillations are said to be under damped, b) over damped. [5+5]

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# 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**

1.a)

# **PART-A**

# Code No: 151AB



(25 Marks)

Max. Marks: 75

- 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]
- 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]
- 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]
- 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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