R18

Code No: 151AB

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech I Year I Semester Examinations, May/June - 2019
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, c as sub questions.

PART- A

(25 Marks)

1.a) What difficulty you will encounter if you would like to derive the Newton equations of motion in polar coordinates? [2]
b) What is angular simple harmonic motion and give two examples of angular S.H.M.[2]
c) Define quality factor of a damped oscillator. [2]
d) Give importance of resolving power of an optical instrument. [2]
e) Why population inversion is necessary for lasing action? [2]
f) Define scalar under rotation with example. [3]
g) Represent the simple harmonic motion interms of complex number. [3]
h) A particle of mass 100 gm is placed in a field of potential $U = 5x^2 + 10$ erg/gm. Find the frequency. [3]
i) State the superposition theorem. [3]
j) Explain total internal refection. [3]

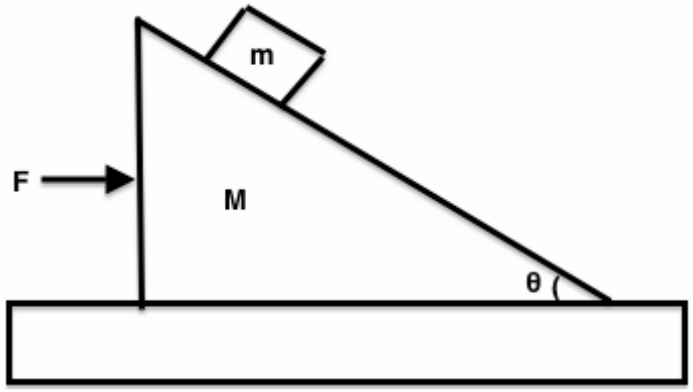
PART –B

(50 Marks)

2.a) Show that Newton's second law is inavriant under Galilean transformation.
b) A body weighing 200 N is just on the point of moving up the plane by a force of 40 N acting parallel and up the plane. Find co-efficient of friction if inclination of the plane is 15^0 to horizontal. [5+5]

OR

3.a) With the help of a neat diagram deduce the equation for velocity of a body in terms of polar coordinate system.
b) A wedge with mass M rests on a frictionless horizontal tabletop. A block with mass m is placed on the wedge. There is no friction between the block and the wedge. The system is released from rest. Calculate the acceleration of the wedge. [7+3]



4.a) Solve the differential equation of a damped harmonic oscillator. Investigate the conditions under which the oscillations are said to be light, heavy and critically damped.

b) Considering quality factor of sonometer wire of frequency 260 Hz as 2000, calculate the time in which the amplitude decreases to $1/e^2$ of its initial value. [7+3]

OR

5.a) Give the theory of oscillations in an electrical oscillator with small resistance. Deduce expression for frequency of oscillation.

b) Differentiate an electrical oscillator from a mechanical oscillator. [7+3]

6. Two media of characteristic impedance Z_1 and Z_2 coupled through an element of impedence Z and length l. The boundaries of coupling element are located at x = 0 and x= l. The wave enters the coupling medium at x= 0 and leaves at x= l. Show that $Z = \sqrt{(Z_1 Z_2)}$ [10]

OR

7.a) Obtain an expression for the velocity of longitudinal wave in fluid medium interms of volume elasticity and density.

b) Deduce the formula for characteristic impedance of a continuous stretched string. [5+5]

8.a) Explain the working of Michelson interferometer and describe how refractive index of a material is determined.

b) When a thin film of a transparent material of μ=1.45 and λ = 5890Å is inserted in one of the arms of a Michelson's interferometer, a shift of 65 circular fringes is observed. Calculate the thickness of the film. [7+3]

OR

9.a) Obtain conditions for maxima and minima in Fraunhofer diffraction due to a single slit. Calculate width of the central maxima.

b) A plane wave of light with wavelength 500 nm falls on a slit of width 10^{-5} cm at an angle 30^0 to its normal. Find the angular position of first minima located on both sides of central maximum. [7+3]

10.a) Explain Acceptance angle for an optical fibre and derive expression for it.

b) For an optical fibre fractional index change is 0.14 and refractive index of cladding is 1.3. Calculate refractive index of core. [7+3]

OR

11.a) Describe the construction and working of a CO_2 laser with suitable neat diagram.

b) Distinguish between ordinary light and laser light. [7+3]

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