

Subject: Physics
Level: BE(II)

Full Marks: 70
Pass Marks: 35
Time: 2 Hrs

Attempt all of the following questions.

1. a) Write down the differential equation for simple harmonic motion. Derive the relation for time period of compound pendulum and show that the point of suspension and point of oscillation are interchangeable. **2+6=8**

b) A body of mass 0.01 kg is attached to a light spring of force constant 5N/m. The motion starts from rest by displacing the body 0.01 m to the right releasing it. Calculate i) frequency ii) amplitude iii) initial phase iv) total energy and v) maximum velocity. **1+1+2+2+1=7**

2. a) How do you distinguish transverse wave from longitudinal wave? Derive the relation for velocity of transverse wave on a stretched string having mass per unit length, μ . **2+6=8**

b) A wave of frequency 500 Hz has a phase velocity of 350m/s i) How far apart are two points 60° out of phase ii) What is the phase difference between two displacements at a certain point at times 10^{-3} sec apart? **4+3=7**

3. a) How the beats are produced? Starting from the superposition of waves, arrive at the condition for maximum and minimum and thus find the expression for beat frequency. **2+7=9**

b) An ambulance emitting a whine at 1600 Hz overtakes and passes a cyclist pedaling the cycle at 18 Km/hr. After being passed, the cyclist hears a frequency of 1590 Hz. How fast the ambulance is moving? **6**

4. a) Derive the relation for fringe width in the case of Young's double slit experiment. **7**

b) A plane transmission grating having 6000 lines/cm is used to obtain a spectrum of light from a sodium lamp in the second order. Calculate the angular separation between the sodium lines whose wavelengths are 5890 \AA and 5896 \AA . **4**

c) A glass plate having refractive index 1.5 is used as a polarizer. Find the angle of polarization and angle of refraction for it. **4**

5. Write short notes on (Any Two) **5×2=10**

- a)** Malus law
- b)** Brewester's law
- c)** Pressure wave and displacement wave

