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Your Roll No . .

5161

B.Sc. /B.Sc. (Hons.)/I J
PH-101 – PHYSICS
(NC – Admissions of 2008 and onwards)

Time : 3 Hours **Maximum Marks : 75**

(Write your Roll No on the top immediately on receipt of this question paper)

Attempt **five** questions in all including Question No **1,** which is compulsory

1 Attempt any **five**

(a) Show that the length of a rod is invariant under Galilean transformation.

(b) Write postulates of special theory of relativity

(c) What do you mean by the degree of freedom of coupled oscillators ?

(d) What are the necessary conditions for observing interference fringes ?

(e) Why is a NAND gate called a universal gate ? Draw a circuit diagram to obtain OR gate using NAND gates

(f) What do you mean by nano-pollutants ?

(g) Why is metastable state required to make a LASER ?

(h) What do you understand by GPS ? **5 × 3**

2 (a) State and explain the work-energy theorem **2 + 8**

(b) A particle moves along one quarter of the circumference of a circle of radius 0 5 m If the force applied is 0 2 N, inclined at an angle of 60° with the tangent to the circle at the point, calculate the work done **5**

3 (a) Derive the expression for the relativistic Doppler effect based on the special theory of relativity **10**

(b) Two photons are moving in opposite directions in space Find the relative velocity of one with respect to other **5**

4 (a) What do you understand by the phenomenon of beats ? Explain with an example **3**

(b) Write the differential equation for lightly damped oscillator assuming the damping force is directly proportional to velocity of oscillator Solve the equation and show variation of displacement with time graphically **3 + 6 + 3**

5 (a) Discuss Fraunhoffer diffraction due to a single slit Explain what happens when the slit width is gradually increased and when the screen is gradually moved away from the slit **10**

(b) In Fraunhoffer diffraction pattern due to a narrow slit, a screen is placed 2 m away from the slit to obtain the pattern. If wavelength of light is 5000 Å, find the width of the slit when the first minimum lie 5 mm on either side of the central maximum **5**

6 (a) Explain the working of a half-adder circuit Give its truth table **5**

(b) How can an Op-amp be used as a comparator ? Explain its working. **10**

7 (a) Derive Poiseullie's formula for the volume rate of flow of liquid through a tube of circular cross-section **10**

(b) If two capillary tubes of length l_1 and l_2 and radii r_1 and r_2 are joined in series show that volume rate of flow "V" of liquid through the combination is given by

$$V = \frac{\pi P}{8\eta}\left[\frac{l_1}{r_1^4} + \frac{l_2}{r_2^4}\right]^{-1}$$

(P = pressure difference across combinations and η = coefficient of viscosity) **5**

8. Write short notes on any **three** of the following

(a) Lissajous Figures

(b) Light emitting diode and its applications

(c) Importance of Nanoparticles

(d) Young's double slit experiment **3 × 5**
