Student Id | | | | | | | |

B Tech

No. of Pages : 2

Second Semester (End Sem) Examination April-May 2015

Physics (PH101)

Branch : ETC & EEE

Time 3 Hours

Max Marks : 50

Answer any **FIVE** questions [5 X 10 = 50].

The figures in the right hand margin indicate marks

Q.1. (a) Show that the total energy of a free particle executing SHM in constant. [5

(b) An oscillator has a mass of 0.01 kg, a retarding force of 0.1 N-s/m and a restoring force of 10^3 N/m. Find the relaxation time. [3

(c) Write the expression for "Forced Vibration" in differential equation form. [2

Q.2. (a) Write the distinguishing characteristics between progressive wave and stationary wave. [4

(b) Stationary waves are produced by the superposition of two waves given by :

$$Y_1 = 0.02 \sin \pi [t - 2x]$$

$$Y_2 = 0.02 \sin \pi [t + 2x]$$

Find the points where nodes are formed. [3

(c) A uniform string of length 2 metres and mass 200 gm is under tension of 800 N. Calculate the speed of transverse wave in the string. [3

Q.3. (a) Draw a schematic diagram of the Newton's ring experiment to determine the diameter of the dark and bright ring in reflected light. [6

(b) Newton's rings are formed with reflected light of wavelength 5890 Å with a liquid between a plane and curved surface. The diameter of the 5^{th} dark ring is 0.32 cm and radius of curvature of curved surface is 120 cm. Calculate the refractive index of the liquid. [4

Q.4. (a) Distinguish between the Fresnel & Fraunhofer class of diffraction. [3

(b) Draw the graphical representation of Intensity of light with phase (α) in single slit diffraction. [2

(c) How do you compare a zone plate with convex lens ? What must be the radius of 1st transparent zone if the 1st focal length of the zone plate is 1.2 m for wavelength $6000A^0$. [3+2

Q.5. (a) State and explain Brewster's Law of Polarization. Show that the reflected and refracted components are mutually perpendicular to each other. The angle of refraction of an unpolarized light incident at a polarizing angle on a glass block is 32.5°. Calculate the refractive index. [3+2+2

(b) Define birefringence. Distinguish between E-Ray and O-Ray. [1+2

Q.6. (a) Write the expression of Faraday's Law of Electro-magnetic Induction in integral form and show that $\vec{\nabla} \times \vec{E} + \frac{\delta \vec{B}}{\delta t} = 0$. [2+3

(b) Derive the equation of electromagnetic wave in a charge free conducting medium w.r.t. $\vec{E}$ using Maxwell's equations. [3

(c) What is the physical significance of $\vec{\nabla} . \vec{B} = 0$. Is it true for Gauss law of magnetostatics ? [1+1

Q.7. (a) State and explain Einstein's equation for explaining photoelectric emission. Write the expression for compton's shift. [2+1

(b) What is the magnitude of the momentum carried by the photon of v and calculate the energy of a photon of momentum $\frac{h \times (10^{+10}\ m)}{6000}$ [1+1

(c) The wave function of a system is given by $\psi = a\psi_1 + b\psi_2 + c\psi_3$. If E_1, E_2 & E_3 are the energy Eigen values in three states respectively. The uncertainty in velocity of an electron is 7.3×10^5 m/sec. Find the uncertainty in its position. Write the expression for the probability density of a wave function. [2+2+1