Registration No. : | | | | | | | | | | |

Total number of printed pages – 2

B. Tech
BS 1102

First Year Special Examination – 2014

PHYSICS – I

BRANCH : AEIE, AUTO, BIOTECH, CHEM, CIVIL, CSE, EC, EEE,, ELECTRICAL, ENV, ETC, FASHION, IEE, IT, MANUFACT, MECH, MME, PLASTIC, TEXTILE

QUESTION CODE : G 382

Full Marks – 70

Time : 3 Hours

*Answer Question No. **1** which is compulsory and any **five** from the rest.*
The figures in the right-hand margin indicate marks.

1. Answer the following questions : 2×10
   (a) State Heisenberg's uncertainty principle.
   (b) Define Resonance. How the sharpness of resonance depend upon damping ?
   (c) What is Compton effect ?
   (d) In a Newton's ring experiment, the diameter of bright rings are proportional to the square root of natural numbers. Are the rings formed by reflected light or transmitted light ? Explain.
   (e) Write the integral form of the Ampere's circuital law.
   (f) Two sinusoidal waves of same frequency and having amplitudes A_1 and A_2 respectively superpose coherently. Write the expression for the maximum and minimum values of the intensity of the resultant wave.
   (g) Express electric field in terms of vector potential and scalar potential.
   (h) A Particle of mass m moves along the Y- axis under a potential V(y). Write the time dependent schrodinger equation for the particle.
   (i) Mention the characteristics of wave function.
   (j) What is the angle between the plane of polarization and plane of vibration in a plane polarized beam.
2. (a) An oscillator is subjected to an external sinusoidal periodic force and a damping force proportional to its velocity. Set up a differential equation of the oscillator. Mention the condition under which velocity resonance occurs. 5

(b) Graphically show the displacement time curve for oscillatory , over damped and critically damped motion of a damped oscillator. Mention the condition of their occurrence. 5

3. (a) With the help of a suitable ray diagram, describe the production of Newton's ring. 5

(b) In Newton's ring experiment , the diameter of n^{th} and $(n+8)^{th}$ bright rings are 4.6 mm and 7.4 mm respectively. The radius of curvature of the lower surface of the lens is 2m. Determine the wavelength of light. 5

4. (a) Distinguish between Fresnel diffraction and Fraunhoffer diffraction . 4

(b) A transmission grating has 8000 rulings per cm. The first order principal maximum due to monochromatic source of light occurs at an angle of 30°. Determine the wavelength of light. 2

(c) Bring out the similarities and differences between a zone plate and a converging lens. 4

5. (a) Describe the construction and working of a Nicol prism. 5

(b) Distinguish among plain polarized, circularly polarized and unpolarised light. 5

6. (a) Write maxwell's electromagnetic equations in free space in the presence of charges and currents . Name each symbol used in the equations. 5

(b) State and explain poynting theorem. 5

7. (a) State Brewster's law and hence prove that the angle between the reflected and refracted ray is 90° . 5

(b) Using Gauss divergence theorem, prove that volume of a sphere is $\frac{4}{3}\Pi r^3$. 5

8. (a) Prove that the momentum of a particle in one dimensional well of infinity height is quantized. 3

(b) What is the physical significance of curl of a vector function ? 3

(c) 12 million electrons with energy 3.0 eV are incident on a potential barrier of 9.0 eV high and 0.50 mm width. Calculate how many electrons will tunnel through the barrier . 4