15162

2 Hours / 50 Marks   Seat No. ☐☐☐☐☐☐☐

Instructions :   (1)   All Questions are *compulsory*.

(2)   Answer each next main Question on a new page.

(3)   Illustrate your answers with neat sketches wherever necessary.

(4)   Figures to the right indicate full marks.

(5)   Assume suitable data, if necessary.

(6)   Use of Non-Programmable Electronic Pocket Calculator is permissible.

(7)   Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1.   Attempt any NINE of the following :   **18**

(a)   Define :   (i)   Angular displacement

(ii)   Angular acceleration

(b)   State Newton's first law of motion. Give one example.

(c)   Define the terms :

(i)   Projectile motion

(ii)   Trajectory

(d)   Find the frequency of a photoelectron of energy 4.2 eV.

(e)   Define the terms :

(i)   Audible Range

(ii)   Infrasonic waves.

(f)   Define impulse and impulsive force.

(g)   Explain the property of lasers that enables the medical practitioners to use them for cataract operations.

(h) A vehicle of mass 2000 kg is moving with a speed of 3000 cm/sec. Calculate the momentum of the car.

(i) State any two factors affecting thermo emf.

(j) A car moving with an initial velocity 90 km/hr comes to rest in 10 seconds when brakes are applied. Find the retardation value.

(k) State any two applications of ultrasonic testing.

(l) State any four methods of non-destructive testing.

2. Attempt any FOUR of the following : **16**

(a) Explain the terms :

   (i) Spontaneous emission &

   (ii) Stimulated emission with reference to lasers.

(b) An object projected upwards making an angle of 38° with the horizontal moves with an initial speed of 60 m/sec. Calculate

   (i) The distance from the point of projection at which the object strikes.

   (ii) The time taken by the object to reach ground.

(c) Explain the variation of thermo emf with temperature with the help of a neat graph & hence define the terms :

   (i) Neutral temperature

   (ii) Inversion temperature

(d) Describe how X-rays are produced by using modern Coolidge tube.

(e) Explain liquid penetration testing method to detect surface discontinuities with the help of principle & experimental procedure.

(f) If light of wavelength 3000 Å is incident on a metal surface of photoelectric work function 3 eV, will the electrons be ejected from the metal surface or not ? If yes, calculate the maximum kinetic energy of the photoelectrons emitted.

(Planck's constant, $h = 6.63 \times 10^{-34}$ J-sec.)

3. **Attempt any FOUR of the following :** **16**

   (a)   A vehicle covers 68 m in 6th second and 92 m in 9th second of its motion. Calculate the acceleration and the distance covered by it in 16th second of its motion.

   (b)   Explain the production of ultrasonic waves by piezoelectric method.

   (c)   State any four characteristics of photoelectric effect.

   (d)   Define recoil of gun. Derive the expression for recoil velocity of gun.

   (e)   (i)   State Joule's law and write its mathematical form.

        (ii)   Calculate the amount of heat generated when a current of 2 Amp flows through a resistance of 6.4 Ω for 10 minutes.

   (f)   Calculate the minimum wavelength and maximum frequency of X-rays produced by an X-ray tube operating at 60 kV.

   (h = 6.63×10^{-34} J-sec; e = 1.6×10^{-19} C, c = 3×10^{8} m/sec.)

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