

APPLIED PHYSICS*Time Allowed: 2 Hours**Full Marks: 35***Answer to Question No.1 is compulsory and to be answered first.****This answer is to be made in separate loose script(s) provided for the purpose.****Maximum time allowed is 30 minutes, after which the loose answer scripts will be collected and fresh answer scripts for answering the remaining part of the question will be provided.****On early submission of answer scripts of Question No.1, a student will get the remaining script earlier.****Answer any five questions from the rest.**

1. Answer the following questions (any ten):

10x1

- i) A body of mass 'm' has kinetic energy E; its momentum will be – (a) $\frac{2m}{E}$ (b) $\sqrt{2mE}$ (c) $\frac{E^2}{2m}$ (d) None of these.
- ii) A ball of mass 5 kg strikes a wall with a speed of 10 m/s and rebounds with the same speed. The change in momentum of the ball is – (a) Zero (b) 50 kg m/s (c) 100 kg m/s (d) none of these.
- iii) For a particle moving uniformly around a circular path of radius r which of the following is true? – (a) $w = \frac{v}{r}$ (b) $w = v \times r$ (c) $w = \frac{r}{v}$ (d) none of these.
- iv) Lenz's law is a consequence of – (a) Conservation of linear momentum (b) Conservation of angular momentum (c) Conservation of energy (d) Conservation of mass.
- v) Two resistances of 6Ω and 3Ω are connected in parallel and the combination is connected across a 6 V battery. The total power consumed is – (a) 12 watt (b) 18 watt (c) 2 watt (d) 36 watt.
- vi) A conductor moves in a magnetic field. The direction of the induced e.m.f. is obtained from – (a) Laplace's law (b) Fleming's left hand rule (c) Fleming's right hand rule (d) None of these.
- vii) The S.I unit of magnetic flux density is – (a) Am^{-1} (b) Oersted (c) Gauss (d) Tesla.
- viii) If the inversion temperature is θ_i , neutral temperature is θ_n and the temperature of the cold junction is θ_c , then – (a) $\theta_c + \theta_i = 0$ (b) $\theta_i - \theta_c = 2 \theta_n$ (c) $\theta_c + \theta_i = 2 \theta_n$ (d) $\theta_c - \theta_i = 2 \theta_n$.
- ix) A body was travelling with uniform velocity u when it was stopped within a distance S by an opposing force F. If the opposing force be 2F the stopping distance would be – (a) 2S (b) S (c) S/2 (d) S/4.
- x) Holography produces – (a) Real image (b) Virtual image (c) both (a) & (b) (d) none of these.
- xi) Time displacement graph of two particles, the angle between graphs with time axis are respectively 30° and 60° . The ratio of their velocity is – (a) $\sqrt{3}:1$ (b) $1:\sqrt{3}$ (c) 3:1 (d) 1:3.
- xii) The ratio of the mass of two bodies is 3: 2. If kinetic energies are equal, the ratio of their linear momenta is – (a) 3 :2 (b) 2 : 3 (c) $\sqrt{3} : \sqrt{2}$ (d) $\sqrt{2} : \sqrt{3}$.
- xiii) Nichrome wire is used as the heating element because it has – (a) Low specific resistance (b) low melting point (c) high specific resistance (d) high conductivity.

- xiv) The energy of a photon of characteristic X-ray from a Coolidge tube comes from – (a) the kinetic energy of the free electrons of the target (b) the kinetic energy of ions of the target (c) the kinetic energy of the striking electron (d) an atomic transition in the target.
- xv) Magnetic field due to a long straight current carrying conductor is – (a) $(\mu_0/4\pi)\frac{2I}{r}$ (b) $(\mu_0/4\pi)\frac{I}{r}$ (c) $(\mu_0/2\pi)\frac{2I}{r}$ (d) None of these.
- xvi) In which conductor holes are majority carrier – (a) P-type semi-conductor (b) n-type semi-conductor (c) bad conductor (d) metal.
- xvii) The pumping method used in He – Ne laser is – (a) Optical method (b) Gas – dynamic pumping (c) chemical pumping (d) electrical pumping.
2. a) If the velocity of a car moving along a straight path be doubled, the distance by which it can be stopped becomes four times. Explain.
 b) Can the velocity-time graph of an object be a straight line parallel to velocity axis? Explain.
 c) A force of 12 N produce an acceleration of 3m/s^2 on a body and an acceleration 4m/s^2 on another body of different mass. What will be the acceleration if the same force is applied on the combined mass? 1+2+2
3. a) State the parallel axis theorem.
 b) What is radius of gyration? Write dimension of moment of inertia. 2+(2+1)
4. a) Write down the principle of conservation of linear momentum.
 b) A bullet moving with a speed 200ms^{-1} can penetrate 4 cm thick wooden board. What will be suitable speed of the bullet to penetrate 16 cm thick same wooden block?
 c) A stone is dropped from the top of the tower 50 m high. At the same time another stone is thrown up from the foot of the tower with a velocity of 25m s^{-1} . At what distance from the top and after how much time the stones cross each other? 1+2+2
5. a) State briefly the origin of thermo emf.
 b) What is meant by “Thermo electric power”? Write its unit. 2+(2+1)
6. a) We do not experience any electrostatic field near a current carrying conductor inspite of flow of huge number of electrons through it. Explain in brief.
 b) What is the work done by the magnetic field on moving charge? 3+2
7. a) What is superconductivity?
 b) Draw the graph between the resistivity and the temperature for a super conductor. 2+3
8. a) A force acts on a rest body of mass 2 kg for 5 seconds and then force ceases to act and the body moves 80 m during 4 seconds. Find how much force was applied on the body?
 b) Explain – (i) why gun recoils at the time of firing? (ii) why bird cannot fly in vacuum? 3+1+1
9. a) Write the properties of X-ray.
 b) How much voltage be applied in X – ray tube such that the minimum wavelength of the emitted X – ray will be 1 angstrom?
 c) Explain graphically the continuous and characteristics spectra indicating λ_{min} . 1+2+2
10. a) Explain the term population inversion & optical pumping?
 b) Explain the working of He- Ne Laser.
 c) Mention some important application of LASER. 2+2+1