

Question Paper 2018 (June)

1 A. Choose the correct answer from the given alternative (any ten):

i) The retardation (f) a particle moving along a straight path varies with time (t) as $f = 4t$. If the initial velocity of the particle be zero, find the time which the velocity increase to 32 ms^{-1}

- (a) 16 s ✓(b) 8 s (c) 4 s (d) 2 s

ii) The recoil of a gun after firing a shell is due to the principle of conservation of –

- (a) mass (b) linear momentum
(c) angular momentum ✓ (d) kinetic energy

iii) An electric fan is running at an angular speed of 120 rpm. The angular retardation developed after switching off the fan is $\pi/2 \text{ rad s}^{-2}$. Find the time in which the angular speed decreases to 30 rpm –

- (a) 57.3 s (b) 6.0 s ✓ (c) 3.0 s (d) 0.96 s

iv) The moment of inertia (I) of a particle of mass m about an axis is given by (r = perpendicular distance of the particle from the axis) –

- (a) $I = mr$ (b) $I = m/r$ (c) $I = m/r^2$ ✓ (d) $I = mr^2$

v) According to work-energy theorem, the work done by a force on a moving body is equal to –

- (a) change in kinetic energy of the body
(b) change in potential energy of the body
✓ (c) rate of change of momentum of the body
(d) change in momentum of the body

POLY-AP

- vi) The specific resistance of a conductor depends upon –
- | | |
|------------------------------------|--|
| (a) length of the conductor | (b) area of cross-section of the conductor |
| ✓ (c) temperature of the conductor | (d) none of these |
- vii) An air-filled very long solenoid of length L and total number of turns N is carrying a current I . The magnetic field well inside the solenoid is (μ_0 = permeability of air)
- | | |
|---------------------------|-------------------------|
| (a) $B = \mu_0 N I$ | (b) $B = \mu_0 N I L$ |
| ✓ (c) $B = (\mu_0 N I)/L$ | (d) $B = (\mu_0 L I)/N$ |
- viii) The SI unit of self- inductance is Henry which can also be expressed as -
- | | |
|--|--------------------------------|
| (a) volt s amp | ✓ (b) volt s amp ⁻¹ |
| (c) volt s ⁻¹ amp ⁻¹ | (d) volt s amp ⁻² |
- ix) The value of the energy band gap for germanium crystal is –
- | | |
|--------------|---------------|
| (a) 1.1 eV | (b) 0.11 eV |
| (c) 0.068 eV | ✓ (d) 0.68 eV |
- x) The penetrating power of X-rays produced by an X-ray tube can be increased by -
- | | |
|-------------------------------------|-----------------------------------|
| (a) increasing the filament current | ✓ (b) increasing the tube voltage |
| (c) decreasing the filament current | (d) decreasing the tube voltage |

Group -A

2. (a) Establish Newton's third law using second law and the principle of conservation of linear momentum.

(b) Define the term 'impulse of a force'. Write down its relation with momentum.

See Chapter: Particle Dynamics, Question No. 19 of Long Answer Type Questions.

3. (a) Establish the relation between linear speed and angular speed of a particular executing circular motion.

(b) A body is released from the top of a tower. It reaches the ground after 3 seconds. Calculate the height of the tower and the velocity of the body just before touching the ground. Also calculate the distance travelled by the body in the last second of its journey.

($g = 10.0 \text{ m s}^{-2}$).

See Chapter: Particle Dynamics, Question No. 20 of Long Answer Type Questions.

APPLIED PHYSICS

4. (a) State the principle of conservation of mechanical energy. Prove that the total mechanical energy of freely falling body under gravity is conserved.
- (b) Express power in terms of force and velocity. Write down the expression of the potential energy stored in a spring of spring constant k when it is stretched (elongated) by small amount δx .

See Chapter: Work Power and Energy, Question No. 8 of Long Answer Type Questions.

5. (a) Define temperature coefficient of resistance of a substance. What do you mean by the term 'critical temperature' in respect to the phenomenon of superconductivity?
- (b) The resistance of a coil at 30°C is 15 ohm. If the resistance of the coil at 100°C be 18 ohm, calculate the value of the temperature coefficient of resistance of the coil.

See Chapter: Current Electricity, Question No. 16 of Long Answer Type Questions.

6. (a) What is Seebeck effect? Write down one importance of Seebeck series.
- (b) An electric bulb is rated 60 W at 220 V. Calculate the resistance of the bulb. If the bulb be connected across a 200 V supply calculate the current through the bulb and the electric energy consumed by the bulb in one hour. <https://www.wbscteonline.com>

See Chapter: Current Electricity, Question No. 17 of Long Answer Type Questions.

Group-B

7. (a) Two long parallel conductors carrying currents in the same direction (like currents) attract each other—explain.
- (b) Lenz's law in electromagnetic induction is consistent with the principle of conservation of energy—explain.
- (c) Define self-inductance of a coil in terms of magnetic flux.

See Chapter: Electromagnetism, Question No. 10 of Long Answer Type Questions.

8. (a) Briefly state the principle of generation of alternating current and name the basic components of an AC generators.

(b) State Fleming's right hand rule.

a) See Chapter: Current Electricity, Question No. 18 of Long Answer Type Questions.

b) See Chapter: Electromagnetism, Question No. 11 of Long Answer Type Questions.

9. (a) Explain full wave rectification by bridge rectifier (circuit diagram, input and output wave forms are essential).

(b) Explain the term 'depletion region' in p-n junction.

See Chapter: Modern Physics, Question No. 12 of Long Answer Type Questions.

10. (a) Write down the basic properties of LASER beam which make it different from ordinary light.

(b) Draw the curve showing the variation of intensity with wavelength of X-rays obtained from X-ray tube and mark cut-off wavelength (λ_{\min}), continuous & characteristic X-rays.

See Chapter: Modern Physics, Question No. 13 of Long Answer Type Questions.

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