

Program: Diploma in Civil/Architecture/Ref&AC/
Electronic/Mechanical/Electrical/E&E/
Automobile/IT/Computer/Geomatics Engineering

Full Marks: 60

Pass Marks:24

Year/Part: I/I [New + Old Course]

Time: 3 hrs

Subject: **Physics**

*Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicates full marks.*

Group "A" Attempt Any Three questions. [3×6=18]

1. State the principle of conservation of linear momentum. Show that the principle follows Newton's third law of motion.
2. What is satellite? Derive an expression for the escape velocity from the surface of earth.
3. Derive the relation $C_p = C_v + R_1$, Where symbols have their usual meanings, C_p is always greater than C_v why?
4. Define magnetic field intensity. Derive an expression for the magnetic field intensity at a point on the equatorial line of a bar magnet.

Group "B" Attempt Any Six questions. [6×3=18]

5. Write the differences between scalar and vector product.
6. Prove that the coefficient of static friction is equal to the tangent of angle of repose.
7. What is simple harmonic mean? Show that the motion of simple pendulum is simple harmonic motion.
8. Define coefficient of superficial expansion of a solid and establish the relation between coefficient of superficial expansion and coefficient of linear expansion of a solid.
9. Define isothermal process. Derive the expression for the work done in isothermal process.
10. Define refractive index. Show that the refractive index:

$$(\mu) = \frac{\text{Real Depth}}{\text{Apparent Depth}}$$

11. Deduce the mirror formula using concave mirror.
12. Explain the domain theory of ferromagnetism.

Group "C" Attempt Any Six questions. [6×4=24]

13. A block sliding down an inclined plane at 30° . If the coefficient of sliding friction between two surfaces is 0.2, determine the acceleration of the block. ($g=10\text{m/s}^2$)

14. A bucket of water having total mass 3kg is whirled by using rope in a vertical circle of radius 1.5m with a speed of 6m/s. Find the maximum and minimum tension on the rope.
15. An object 20mm high is placed 10cm from a spherical mirror and forms a virtual image which is 40mm high. What is the radius of curvature of the mirror?
16. Calculate the angle of prism with refractive index 1.5 which produces an angle of minimum deviation of 37.20° .
17. A glass rod of length 1.03m at 0°C is heated to 50°C . Find the coefficient of linear expansion of the rod, if its increase in length is 0.24mm.
18. What is the result of mixing 10gm ice at -8°C to 10gm water at 20°C , given that:
Specific heat capacity of ice = $0.5 \text{ Cal gm}^{-1} \text{ c}^\circ$ ⁻¹
Latent heat of fusion of ice = 80 cal gm^{-1}
Specific heat capacity of water = $1 \text{ Cal gm}^{-1} \text{ c}^\circ$ ⁻¹
19. A bar magnet 10cm long is placed along the magnetic meridian with its North pole pointing North. The neutral point is obtained at a point 20cm from each pole. Calculate the pole strength and magnetic moment of the magnet.
 $\mu_0 = 4\pi \times 10^{-7} \text{ TmA}^{-1}$ and $H = 3.4 \times 10^{-5} \text{ T}$

"Good Luck!"

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