

**Diploma in Civil Engineering / Diploma
in Electrical & Mechanical Engineering**

00789

**Term-End Examination
December, 2010**

BET-012 : PHYSICS

Time : 2 hours

Maximum Marks : 70

Note : Question No. 1 is compulsory. Attempt four more questions from Question No. 2 to Question No. 7. Use of calculator is permitted.

1. Choose the correct alternative :- 14x1=14

- (i) Sudden fall of atmospheric pressure by a large amount indicates
- (a) storm (b) rain
- (c) fair weather (d) cold wave
- (ii) With increase of temperature, the viscosity
- (a) of liquids and gases increases for both.
- (b) of liquids and gases decreases for both.
- (c) increase for liquids and decreases for gases.
- (d) decreases for liquids and increases for gases.

- (iii) In cold countries, water pipes sometimes burst because,
- (a) pipe contracts.
 - (b) water expands on freezing.
 - (c) when water freezes, pressure increases.
 - (d) when water freezes, it takes heat from pipes.
- (iv) The change in temperature of a body is 50°C . The change in temperature on the Kelvin Scale will be
- (a) 70 K
 - (b) 30 K
 - (c) 50 K
 - (d) 323 K
- (v) A refrigerator with its power on, is kept in a closed room, with its door open. The temperature of room will
- (a) rise
 - (b) fall
 - (c) remains the same.
 - (d) depends on area of the room.
- (vi) The speed of sound will be greatest in
- (a) air
 - (b) vacuum
 - (c) water
 - (d) metal
- (vii) A person standing in front of a mirror finds his image larger than himself. This implies that the mirror is
- (a) convex
 - (b) parabolic
 - (c) plane
 - (d) concave

- (viii) One cannot see through fog because
- fog absorbs light.
 - light is scattered by the droplets in fog.
 - light suffers total internal reflection at the droplet in fog.
 - the refractive index of fog is infinity.
- (ix) A person uses spectacle of power + 2D. He is suffering from
- short sightedness or myopia.
 - long sightedness or hypermetropia.
 - presbyopia.
 - astigmatism.
- (x) At what angle must two plane mirrors be placed so that the incident and resulting reflected rays are always parallel to each other :-
- 0°
 - 30°
 - 60°
 - 90°
- (xi) In SI, unit of permittivity is :-
- Nm^2C^{-2}
 - $\text{Nm}^{-2}\text{C}^{-1}$
 - $\text{C}^2\text{N}^{-1}\text{m}^{-2}$
 - Am^{-1}
- (xii) The electrical resistance of metals
- increases with an increase in temperature.
 - decreases with an increase in temperature.
 - is independent of temperature.
 - sometimes increases, sometimes decreases with temperature.

(xiii) Magnitude of the magnetic intensity of a point due to a current in a conductor is given by :-

- (a) Biot - Savart rule.
- (b) Right hand thumb rule.
- (c) Fleming's left hand rule.
- (d) Coulomb's law.

(xiv) The magnetic field lines .

- (a) intersect at the neutral point.
- (b) intersect near north and south poles.
- (c) cannot intersect at all.
- (d) depend upon the position of the magnet.

2. (a) How is surface energy related to surface tension of a liquid? What effects does temperature have on surface tension of a liquid? 4+5+5

(b) A 5.0m long copper wire of cross-sectional area 1.5cm^2 is stretched by a force of $5.4 \times 10^3\text{N}$. If the Young's modulus for copper is $1.2 \times 10^{11}\text{Nm}^{-2}$, calculate

- (i) the stress
- (ii) the strain, and
- (iii) increase in the length of the wire.

- (c) The cylindrical tube of a spray pump has a cross-section of 8.0cm^2 , one end of which has a 40 fine holes each of diameter 0.1mm. If the liquid flow inside the tube is 1.5m min^{-1} , calculate the speed of ejection of the liquid through the holes?
3. (a) Define radiation? List out the main properties of heat radiation. 4+5+5
- (b) A copper calorimeter weighing 300gm is at temperature 20°C . When 60gm of water at 30°C is poured into the calorimeter cup, the temperature of the cup-water system becomes 26.8°C . Calculate the specific heat capacity of the cup.
- (c) Calculate the average energy of an air molecules at a temperature of 400K.
- Given : Boltzmann constant
 $K_b = 1.38 \times 10^{-23}\text{JK}^{-1}$.
4. (a) Write Newton's formula for velocity of sound in air. What correction was applied to it by Laplace? 4+5+5
- (b) Discuss the effect of density, pressure and temperature on the velocity of sound in air.
- (c) At what temperature will the speed of sound be double its value of 273 K?

5. (a) State two conditions for producing total internal reflection. 4+5+5
- (b) Determine the location and nature of the images formed by a convex lens when the object is placed at
- (i) between F and $2F$,
- (ii) between F and the centre of the lens.
- (c) Calculate the critical angle for a material of refractive index $\sqrt{2}$.
6. (a) State Kirchhoff's rules for electrical network.
- (b) Calculate the electrical potential at a point P due to a charge of $3 \times 10^{-8}\text{C}$ situated 10cm away. Also determine the work done in bringing a charge of $2 \times 10^{-9}\text{C}$ from infinity to the point P .
- (c) Three resistors 3Ω , 4Ω , 8Ω are combined in series and the combination is connected to a battery of 30V . Calculate the total resistance of the series combination and potential drop across each resistors. 4+5+5
7. Write short notes on *any four* of the following :-
- (a) Diamagnetic substance. 4x3¹/₂=14
- (b) Voltmeter.
- (c) Secondary Cell.
- (d) Wheatstone bridge.
- (e) Astronomical Telescope.
- (f) Mirage.
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