



Marks : 70

Time : 8.30 am to 11.30 am

Note :

- 1) All sections are compulsory.
- 2) All symbols have their usual meaning unless and otherwise stated.
- 3) Figures to right indicate full marks.
- 4) Draw the diagrams wherever necessary.
- 5) Use of logtable is allowed.
- 6) For each MCQ correct answer must be written along with its alphabet.

e. g - a) _____ / b) _____ / c) _____ / d) _____

Q.1 Select and write the most appropriate answer from the given alternatives for each subquestion. (15)

- i) Light year is a unit of _____.
a) Time
b) Mass
c) Distance
d) Luminosity
- ii) For two vectors to be equal, they should have the _____.
a) same magnitude
b) same direction
c) same magnitude and direction
d) same magnitude and opposite direction
- iii) An object thrown from a moving bus is an example of _____.
a) uniform circular motion
b) rectilinear motion
c) projectile motion
d) motion in one dimension
- iv) The value of acceleration due to gravity is maximum at _____.
a) the equator of the Earth.
b) the centre of the earth
c) the pole of the earth
d) slightly above the surface of the earth.

- v) Consider the following statements.
- 1) The coefficient of linear expansion has dimension $[K^{-1}]$
 - 2) The coefficient of volume expansion has dimension $[K^{-1}]$
- a) 1 and 2 both are correct.
 - b) 1 is correct but 2 is wrong.
 - c) 2 is correct but 1 is wrong.
 - d) 1 and 2 both are wrong.
- vi) When sound waves travel from air to water which of these remains constant?
- a) velocity
 - b) frequency
 - c) wavelength
 - d) all of above
- vii) An electron is placed between two parallel plates connected to a battery. If the battery is switched on, the electron will _____ .
- a) be attracted to the positive plate.
 - b) be attracted to the negative plate.
 - c) remain stationary.
 - d) will move parallel to the plates.
- viii) A reverse biased diode is equivalent to _____ .
- a) an off switch
 - b) an on switch
 - c) a low resistance
 - d) none of the above.
- ix) A frame of reference in which Newton's law of inertia does not hold good is called _____ .
- a) inertial frame of reference.
 - b) non- inertial frame of reference.
 - c) polar frame of referance.
 - d) pseudo frame of reference.
- x) The thermal energy is also called as _____ .
- a) kinetic energy
 - b) mechanical energy
 - c) heat energy of single atom
 - d) internal energy of a body.
- xi) Semiconductors are the materials whose _____ lies between that of conductors and insulators.
- a) conductivity
 - b) valency
 - c) resistivity
 - d) all of them

- xii) Charge per unit area is called _____.
 1) linear charge density 2) volume charge density
 3) surface charge density 4) unit charge density
- xiii) A constant force of $(2\hat{i} + 3\hat{j} + 5\hat{k})$ N produces a displacement of $(3\hat{i} + 3\hat{j} + 2\hat{k})$ m then work done is _____.
 a) 5J b) 15J
 c) 25J d) 50J
- xiv) A shell is fired at an angle of 30° to the horizontal with velocity 196 m/s. The time of flight is _____. ($g = 9.8 \text{ m/s}^2$)
 a) 6.5 s b) 10 s
 c) 16.5 s d) 20 s
- xv) The force of gravitation between two bodies of mass 1 kg each separates by a distance of 1 m in vacuum is _____.
 a) $6.67 \times 10^{-9} \text{ N}$ b) $6.67 \times 10^{-10} \text{ N}$
 c) $6.67 \times 10^{-11} \text{ N}$ d) $6.67 \times 10^{-12} \text{ N}$
 (Given - $G = 6.67 \times 10^{-11} \text{ Nm}^2/\text{kg}^2$)

Q.2 Answer the following.

(10)

- i) Convert $1 \mu\text{A}$ into Ampere and write order of magnitude.
- ii) What is uniform circular motion ?
- iii) For a perfectly inelastic collision, what is the value of coefficient of restitution?
- iv) Find the derivative of the function $f(x) = x^8$.
- v) Write the value of period of revolution of polar satellite.
- vi) Which is the fastest mode of transfer of heat?
- vii) The radio station broadcasts at wavelength of 200m. The speed of the radio waves is $3 \times 10^8 \text{ m/s}$. Calculate the frequency for tuning radio station.
- viii) What is thin prism?
- ix) What is electric dipole moment?
- x) What is doping?

Section B

Attempt any eight.

(16)

- Q.3** Draw a neat labelled ray diagram of simple microscope.
- Q.4** State Newton's first and third law of motion.
- Q.5** Draw a neat labelled diagram of a calorimeter.
- Q.6** State two characteristics of longitudinal waves.
- Q.7** State laws of reflection.
- Q.8** State Coulomb's Law of electrostatics. Hence write the formula for force between two point charges.
- Q.9** Differentiate between p- type and n- type semiconductors.
- Q.10** Obtain derivative of $(x \cdot \sin x)$
- Q.11** The resistance $R = \frac{V}{I}$, where $V = (100 \pm 5) \text{ V}$ and current $I = (10 \pm 0.2) \text{ A}$
Calculate the percentage error in R.
- Q.12** The initial speed of a shell is 140 m/s. At what angle must be the gun fired if the projectile is to strike a target at the same level as the gun ?
(The gun and target are 1000 m apart)
(Given - $g = 9.8 \text{ m/s}^2$)

Section C

Attempt any seven.

(21)

- Q.13** a) Write dimensions of Torque.
- b) What is order of magnitude of charge of electron ?
- $q = e = 1.6 \times 10^{-19} \text{ C}$
- c) Write number of significant figures in the given number, 0.003005
- Q.14** In case of dot product of two vectors $\vec{P}$ & $\vec{Q}$, write the value of $(\vec{P} \cdot \vec{Q})$
- for a) $\theta = 0^\circ$ b) $\theta = 180^\circ$
- c) $\theta = 90^\circ$
- Q.15** Derive the expression for time period of conical pendulum. (Draw the diagram)
- Q.16** Write a short note on Gravitational force.
- Q.17** Derive the expression for critical speed of satellite in circular orbit of radius r .
- Q.18** Define coefficient of areal expansion of a solid . Write the formula and unit of it.

Q.19 Explain the effect of humidity on speed of sound.

Q.20 Draw neat and labelled diagram showing

- a) uniform electric field.
- b) lines of force due to negative charge.
- c) lines of force due to opposite charges.

Q.21 The length of a metal rod at 27°C is 4 cm. The length increases to 4.02 cm when the metal rod is heated upto 387°C . Calculate the coefficient of linear expansion of the metal rod.

Section D

Attempt any Two

(8)

Q.22 Write four characteristics of electric lines of forces.

Q.23 Derive prism formula with the help of a neat and labelled ray diagram.

- Q.24**
- i) Draw a neat diagram showing trajectory of a projectile.
 - ii) If the temperature of 4 kg mass of a material of specific heat capacity $300 \text{ J/kg}^{\circ}\text{C}$ rises from 20°C to 30°C . Find the heat received.



