UNIT-1

VERY SHORT ANSWER QUESTIONS(2 Marks each)

1. Name two quantities which are dimensionless in nature.
   [Ans. Angle and strain]
2. Name two quantities which have dimensional formula [$M^1L^{-1}T^{-2}$]
   [Ans. Pressure and Stress
3. Obtain the dimension of (i) pressure (ii) Kinetic Energy
   [Ans.(i) [$M^1L^{-1}T^{-2}$] and (ii) [$M^1L^2T^{-2}$]
4. What is meant by a unit?
   [Ans. Unit is a standard which is used to measure a physical quantity.
5. How are Megameter and nanometer related with each other?
   [Ans. 1 Megameter = 10^{15} nanometer
6. Write the dimensional formula of force and work.
   [Ans. Force = [$M^1L^1T^{-2}$] and Work = [$M^1L^2T^{-2}$]
7. Write the SI unit and dimensional formula of electric Potential.
   [Ans. Volt and [$M^1L^2T^{-3}A^{-1}$]
8. Write down the dimensional formula for Gravitational constant.
   [Ans. [$M^{-1}L^3T^{-2}$]

SHORT ANSWER QUESTIONS (5 Marks each)

1. Write the fundamental units in S.I. system.
2. Prove that the dimensions of kinetic energy and potential energy are same.
3. Check the correctness of the following (i) $v^2-u^2=2as$, (ii) $s = ut + \frac{1}{2}at^2$
4. Obtain the dimensional formula of Thermal Conductivity.
5. Obtain the dimensional formula of Specific heat capacity.

LONG ANSWER QUESTIONS (10 Marks each)

1. States the principle of Homogeneity and check the correctness of following relation. (i) $t = 2\pi \sqrt{\frac{g}{}}$ and (ii) $v = \sqrt{\frac{p}{}}$, where symbols have their usual meanings

$\sqrt{_l}$ $\sqrt{_p}$

2. Prove that (i) 1 Newton = 10^5 dyne and (ii) 1Joule = 10^7 erg by the method of dimensional analysis.

3. Time period of a simple pendulum (T) depends upon length of the pendulum and acceleration due to gravity; find the expression for time period by the method of dimensional analysis.

UNIT-2

VERY SHORT ANSWER QUESTIONS(2 Marks each)

1. Define Scalar and Vector Quantity? Give one example of each of them.
2. State the characteristics of null vector.
3. State the triangle law of vector addition.
4. Define coplanar vector.
5. Find the dot product between $\bar{A} = 3\hat{\imath} + 2\hat{\jmath} + 3\hat{k}$ and $\bar{B} = 5\hat{\imath} - 3\hat{\jmath}$

   [Ans.Here given **A_x=3, A_y=2, A_z=3** and **B_x=5, B_y= -3, B_z=0**

   We know that $\bar{A}\cdot\bar{B} = A_xB_x + A_yB_y + A_zB_z$

   = 3 X 5 + 2 X (-3) + 3 X 0 = 15-6+0=9

6. Find the dot product between $\bar{A} = 5\hat{\imath} + 6\hat{\jmath} + \hat{k}$ and $\bar{B} = 2\hat{\imath} + 3\hat{\jmath}$

   [Ans.Here given **A_x=5, A_y=6, A_z=1** and **B_x=2, B_y=3, B_z=0**

   We know that $\bar{A}\cdot\bar{B} = A_xB_x + A_yB_y + A_zB_z$

   = 5 X 2 + 6 X 3 + 1 X 0

   = 10+18+0=28

SHORT ANSWER QUESTIONS (5 Marks each)

1. State and explain triangle law of vector addition.
2. State and explain Parallelogram law of vector addition.
3. Find the Cross product between $\bar{A} = 2\hat{\imath} + 4\hat{\jmath} + 3\hat{k}$ and $\bar{B} = 4\hat{\imath} + 6\hat{\jmath} + 7\hat{k}$

[Ans. Here given **A_x=2, A_y=4, A_z=3** and **B_x=4, B_y=6, B_z=7**

$$\bar{A}\times\bar{B} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ A_x & A_y & A_z \\ B_x & B_y & B_z \end{vmatrix} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 2 & 4 & 3 \\ 4 & 6 & 7 \end{vmatrix} = 7\hat{\imath}\begin{vmatrix} 4 & 3 \\ 6 & 7 \end{vmatrix} - \hat{\jmath}\begin{vmatrix} 2 & 3 \\ 4 & 7 \end{vmatrix} + \hat{k}\begin{vmatrix} 2 & 4 \\ 4 & 6 \end{vmatrix}$$

$= \hat{\imath}(4\times 7 - 3\times 6) - \hat{\jmath}(2\times 7 - 3\times 4) + \hat{k}(2\times 6 - 4\times 4)$

$= \hat{\imath}(28 - 18) - \hat{\jmath}(14 - 12) + \hat{k}(12 - 16)$

$= \hat{\imath}(10) - \hat{\jmath}(2) + \hat{k}(-4) = 10\hat{\imath} + 2\hat{j} - 4\hat{k}$

4. Drive the resolution of a vector on horizontal and vertical components.

5. Find the Cross product between $\bar{A} = 3\hat{\imath} + 2\hat{\jmath}$ and $\bar{B} = 4\hat{\imath} + 7\hat{\jmath}$

   [Ans. Here given **A_x=3, A_y=2, A_z=0** and **B_x=4, B_y=7, B_z=0**

   $$\bar{A}\times\bar{B} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ A_x & A_y & A_z \\ B_x & B_y & B_z \end{vmatrix} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 3 & 2 & 0 \\ 4 & 7 & 0 \end{vmatrix} = 7\begin{vmatrix} 2 & 0 \\ 7 & 0 \end{vmatrix} - \hat{\jmath}\begin{vmatrix} 3 & 0 \\ 4 & 0 \end{vmatrix} + k\begin{vmatrix} 3 & 2 \\ 4 & 7 \end{vmatrix}$$

$$\begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ B_x & B_y & B_z \\ 4 & 7 & 0 \end{vmatrix}$$

$=\hat{i}(-2\times 0-0\times 7)-\hat{j}(3\times 0-0\times 4)+\hat{k}(3\times 7-2\times 4)$

$=\hat{i}(0-0)-\hat{j}(0-0)+\hat{k}(21-8)=\hat{i}(0)-\hat{j}(0)+\hat{k}(13)=13\hat{k}$

LONG ANSWER QUESTIONS (10 Marks each)

1. Explain different types of vectors with diagram..

UNIT-3

VERY SHORT ANSWER QUESTIONS(2 Marks each)

1. Define rest and motion.
2. Distinguish between distance and displacement.
3. How do you define acceleration? State the unit in which it is measured.
4. What do you mean by horizontal range? Under what condition it is maximum?
5. A body starts from rest and covers a distance by acquiring a velocity of 20m/s in 5 sec. Find the acceleration. [Ans. 4m/s^2
6. A body covers a distanceof 50m along a straight line in 5 sec. Calculate the speed at the end of 5 sec? [Ans. 10m/s
7. Explain the circumstances in which a body has zero average velocity.

   [Answer

   Average velocity = Net displacement/time taken

   Suppose a car covers a distance of 50 m in 5 seconds and comes back to initial position in 5 seconds. The average speed of car is 10 m/s, but average velocity is zero because displacement is zero.

   A body is moving in a circular path and complete one rotation. So, the total displacement is zero. Therefore, average velocity is zero.

SHORT ANSWER QUESTIONS (5 Marks each)

1. Find the relationship between liner velocity and angular velocity.
2. Write short notes on (i) Velocity, (ii) Acceleration, (iii) Displacement
3. Find the relation between linear acceleration and angular acceleration.
4. A body starting from rest moves with an acceleration of 5 m/s^2. Calculate its velocity when it covered a distance of 20m. [Ans. 14.14m/s
5. A body possessing an initial velocity of 10m/s moves an acceleration2m/s^2. Calculate its velocity at the end of 4 sec. [Ans. 18m/s
6. Show that the path of a projectile fired at an angle „θ" with horizontal is parabolic in nature.

LONG ANSWER QUESTIONS (10 Marks each)

1. A projectile is fired with a velocity „u" with makingan angle „θ" with horizontal. Find the following expressions
   (i) Equation of trajectory
   (ii) Maximum height attained
   (iii) Time of ascent
   (iv) Total time of flight
   (v) Horizontal range
   (vi) Condition for maximum horizontal range.

UNIT-4

I. Very short type questions (2 marks each)

1. Define work. Write its formula and unit.
2. Define friction.
3. Define limiting friction. Write its formula.
4. Define coefficient of friction. State its unit and dimension

II. Short type questions (5 marks each)

1. Define limiting friction. State the laws of limiting friction.
2. Write five methods to reduce friction

III. Long type questions (10 marks each)

1. Compare static and kinetic friction. State the laws of limiting friction.
2. Define friction and coefficient of friction. What are the methods to reduce friction?

UNIT-5

VERY SHORT ANSWER QUESTIONS (2 marks)

1. State the unit of g and calculate its dimension.
2. How does g vary with altitude and depth?
3. State the unit of G and calculate its dimension.

SHORT ANSWER QUESTIONS (5 marks)

1. State and explain Newton‟s laws of gravitation. Define G.
2. Differentiate between mass and weight.
3. State and explain the three laws of planetary motion.
4. Derive the relation between g and G.

LONG ANSWER QUESTIONS (10 marks)

1. i. State and explain Newton‟s laws of gravitation

ii. Two particles of masses 1 kg and 2 kg are placed at a distance of 25 cm. Assuming that the only forces acting on the particles are their mutual gravitational, find the initial acceleration of the two particles. Given G = 6.674 $\times 10^{-11} m^3 kg^{-1} s^{-2}$

UNIT-6

Very short type questions (2 marks each)

1. Define simple harmonic motion
2. Define wave motion.
3. Define amplitude and wavelength of a wave.
4. Define frequency and time period of a wave. State the relationship between them.
5. Derive the relationship between velocity, frequency and wavelength of a wave.
6. Define ultrasonics.

Short type questions (5 marks each)

1. Compare transverse and longitudinal wave.
2. Write the properties of ultrasonic wave.
3. Write five applications of ultrasonic wave.

Long type questions (10 marks each)

1. Define simple harmonic motion (SHM). Derive the expressions for displacement, velocity and acceleration of a body executing SHM.
2. Define ultrasonic. State the properties and applications of ultrasonic waves.

UNIT-7

VERY SHORT ANSWER QUESTIONS (2 Marks each)

1. What is the unit of coefficient of liner expansion?

Ans : unit of coefficient of liner expansion in S.I is K^{-1} and in C.G.S $^0C^{-1}$.

2. How are α and β related to each other?

Ans : $\beta = 2\alpha$.Hence $\alpha = \beta / 2$.

3. Define Joule‖s mechanical equivalent of heat.

Ans :Joules mechanical equivalent of heat is defined as the amount of work required to produce a unit quantity of heat.

$$J = \frac{W}{H}$$

4. Define specific heat.
5. What is latent heat? Write its unit and dimension.

SHORT ANSWER QUESTIONS (5 Marks each)

6. Illustrate the phenomenon of thermal expansion with the help of two examples.
7. Define coefficient of superficial expansion and cubical expansion. How are they related to each other?
8. Obtain a relation between (i) α and β (ii) α and γ

9. State the first law of Thermodynamics.
10. How do you define Joule‖s mechanical equivalent of heat? What is its value in SI units?

LONG ANSWER QUESTIONS (10 Marks each)

1. (a) Define coefficient of liner expansion and coefficient of superficial expansion of a material. Obtain a relation between the two.
(b)The length of a rod at 0^0 C is 1m. Calculate its length at 100^0 C. Coefficient of linear expansion of material 1.5×10^{-50} C^{-1}
Ans of (b):
The length of a rod at 0^0 C $=L_{0=}$ 1m=100cm
Change in Temperature$(\Delta T)=T_1 - T_2=100^0C - 0^0C=100^0C$
Coefficient of linear expansion of material $(\alpha) = 1.5 \times 10^{-50}C^{-1}$
Final length at 100^0C $=L_t= L_0(1+\alpha\Delta T) =100\times [1+(1.5 \times 10^{-5}\times 100)] =100.15c.m=1.0015$ m

UNIT-8

VERY SHORT ANSWER QUESTIONS(2 Marks each)

1. How are the angle of incidence and angle of refraction related to each other?
2. What is refractive index?
3. Refractive index of glass and water are respectively 1.5 and 1.3. Which of them is denser optically?
4. What is critical angle?
5. Define total internal reflection?
6. What are the conditions for total internal reflection?

SHORT ANSWER QUESTIONS (5 Marks each)

7. Draw a ray diagram showing reflection at a plane interface. Separating the two media and mark angle of incidence and angle of refraction.
8. State the Laws of refraction.
9. How do you define refractive index of medium 2 with respect to medium 1 in terms of (i) velocity of light in the two media(ii)The absolute refractive indices of the two media.
10. Velocity of light in vacuum is 3×10^8 m/s. What will be its velocity in glass, if its refractive index is 1.5?
11. Explain the principle of working of an optic fiber.
12. Define critical angle and state how it is connected with refractive index

of a medium?

13. Define reflection and state the laws of reflection.

LONG ANSWER QUESTIONS (10 Marks each)

1. (a) What is the phenomenon of total internal reflection? State and explain the conditions in which it can take place.

(b)Refractive index of water with respect to air is 4/3. calculate its critical angle.

2. How do you define refractive index for a medium with respect to another? Give two definitions.
3. Velocity of light in a medium is found to be 2.25 x 10^8 m/s.Calculate its absolute refractive index. Velocity of light in vacuum is 3 x 10^8 m/s

UNIT-9

VERY SHORT ANSWER QUESTIONS (2 Marks each)

1. How do you define electric potential?
2. What is potential and potential difference.
3. Which of the following is not a vector (i) Electric intensity (ii) electric potential?
4. What is the relation between farad and statfarad?
5. What is magnetic flux?
6. What is capacitance?
7. Write the unit and formula of capacitance.
8. Write the unit and formula of electric field
9. Find the relationship between relative permittivity and absolute permittivity.

SHORT ANSWER QUESTIONS (5 Marks each)

10. State and explain Coulomb‖s law of electrostatics?
11. How do you define a unit charge in CGS system and in SI? How are they related with each other?
12. How do you define capacity of a conductor?
13. How do you define electric potential at a point?
14. State and define units of electric potential in CGS system and in SI. How are they related with each other?
15. State and define units of capacity in CGS system and in SI.
16. Obtain a relation between (i) volt and statvolt (ii) Tesla and Gauss.
17. Write the properties of magnetic lines of force.
18. Discuss the principle of a capacitor.

19. Define magnet. State its properties.
20. State and explain Coulomb‖s law of magnetostatic.

LONG ANSWER QUESTIONS (10 Marks each)

1. State and explain Coulomb‖s law of electrostatics. Discuss thenature and value of constant of proportionality involved in it.
2. (a) How do you define Electric intensity at any point in anElectric field? Obtain an expression for the same due to charge "q" ata distance "r" from it.

   (b) Obtain the unit and dimension for permittivity ϵ_0.

3.(a) Obtain the expression for the capacity of a combination of three capacitors connected in series with each other.

   (b) Three capacitors each of 3μf are connected in series with each other. Calculate the resultant capacity of the combination.

4. (a) What will be net capacity of the combination when n number of capacitors are connected in parallel with each other?

   (b) Three condensers each of 3μf are connected in parallel with each other. Calculate the net capacity of the combination.

UNIT-10

Very short type questions(2marks each)

1- State ohm"s law

2- Define Electric current & write down its dimensional formula.

3- Two resistances of 5 ohm and 10 ohm are connected in parallel. Eight such sets are connected in series. Calculate the total resistance.

Ans:- $R_1 = \frac{10x5}{10+5} = \frac{50}{15} = \frac{10}{3}$ ohm

$R_{eq} = \frac{10}{3} \times 8 = \frac{80}{3}$ ohm = 26.6 ohm

4- Two resistances of 10 ohm and 20 ohm are connected in series and twelve such sets are connected in parallel. Calculate the total resistance.

Ans:- $R_1 = 10 + 20 = 30$ ohm

$R_{eq} = \frac{R_1}{12} = \frac{30}{12} = \frac{5}{2}$ ohm

$= 2.5\Omega$

5- Calculate the total resistance when three resistance of 200 ohm, 100 ohm and

50 ohm are connected together: (i) in series and (ii) in parallel.

6- Two resistors when connected in parallel have equivalent resistance of 5/3 ohm. When in series the equivalent resistance is 12 ohm. Find their resistances.

Ans:- $\frac{R_1R_2}{R_1+R_2} = \frac{5}{3}$ ohm (in parallel) and $R_1 + R_2 = 12\Omega$ (in series)

$R_1R_2 = \frac{5}{3}(R_1 + R_2) = \frac{5}{3} \times 12 = 20$

$(R_1 - R_2)^2 = (R_1 + R_2)^2 - 4R_1R_2 = 12^2 - 4 \times 20 = 144 - 80 = 64$

$\Rightarrow R_1 - R_2 = 8$ ohm.....(1)

$R_1 + R_2 = 12$ ohm ..... (2)

Adding (1) & (2) $2R_1 = 20$

$\Rightarrow R_1 = 10\Omega$, $R_1 + R_2 = 12$

$R_2 = 12 - R_1 = 2$ ohm

Short answer type questions(5marks each)

1- State and explain Kirchhoff"s Laws used for analysis of electrical network.

2- A wire of uniform thickness with a resistance of 27 ohm is cut into three equal pieces and they are joined in parallel. Find the equivalent resistance of the parallel combination.

Ans:- $3R = 27 \Rightarrow R = 27/3 = 9\Omega$

The above three resistance in parallelThen $R_{eq} = R/3 = 9/3 = 3\Omega$

3- If the five resistance each of 20 ohm are connected in parallel then again the above resistance connected in series, find the ratio of the equivalent resistance in parallel to that in series.

Ans :- In parallel

$R_1 = 20/5 = 4\Omega$

In Series

$R_2 = 20 \times 5 = 100\Omega$

$\frac{R_1}{R_2} = \frac{4}{100} = \frac{1}{25}$

4- If a 0.6 A of current flows through a resistor. Voltage across two points of resistors is 12 V. What is the resistance of the resistor ?

Ans:- $R = \frac{V}{} = \frac{12}{} = \frac{12}{} = \frac{12x10}{} = 20\Omega$

$I \quad 0.6 \quad 6/10 \quad 6$

Long Answer Questions (10 mark each)

1. (a) State and explain Kirchhoff"s Laws for electricity and obtain the condition forbalanced Wheatstone bridge.
(b) Three arms of a Wheatstone bridge have resistances of P = 10Ω ,Q = 20Ω ,R = 80Ω . What resistance should be inserted in fourth arm to have the bridgeto be balanced ?

Ans:- $\frac{P}{Q} = \frac{R}{S} \Rightarrow \frac{10}{20} = \frac{80}{S}$

$\Rightarrow S = \frac{80 \times 20}{10} = 160\Omega$

2. (a) Draw the diagram and write down the formula for equivalent resistance inseries and parallel combination.
(b) Three resistances each of 9 ohm are connected in parallel to an emf sourceand draws current of 3 ampere, find the value of emf.

Ans:- $R_{eq} = \frac{R}{3} = \frac{9}{3} = 3\Omega$, I = 3 ampere (given)

$\varepsilon = IR_{eq} = 3 \times 3 = 9$ volt

UNIT-11

Very short type questions(2marks each)

1- Define electromagnetic induction.

Ans:- Whenever there will be change in magnetic flux linked with the coil an emf is induced in the coil i.e. phenomenon of production of electricity due to the magnetism is called electromagnetic induction.

2- A straight conductor having length „l" carrying current „I" is placed along the direction of magnetic field „B", Calculate the force on the conductor.

Ans:- $F = il\,B\sin\theta$

Since$\theta = 0^0$, $F = il\,B\sin 0 = 0$

3- State Faraday"s Qualitative law of electromagnetic induction.

4- State Lenz"s law.

5- State Faraday"s Quantitative law of electromagnetic induction.Short answer

type questions(5marks each)

1- State & explain Fleming"s Right hand Rule

2- State & explain Fleming"s Left hand Rule

3- Write down the comparison between Fleming"s Left hand & Right hand Rule

4- State & explain Faraday"s laws of electromagnetic Induction.

5- A magnetic field of 0.012T acts at right angles to the coil of area 0.01m^2 with 1500 turns. The coil isremoved from the field in 0.1 sec. Calculate the emf induced in the coil.

UNIT-12

VERY SHORT ANSWER QUESTIONS (2 Marks each)

1. State the full form of LASER.
2. State two characteristics of LASER.
3. Give one application of LASER.
4. Define spontaneous Emission.
5. Define stimulated emission.

SHORT ANSWER QUESTIONS (5 Marks each)

1. How can LASER help us in industries?
2. What is the use of LASER in surgery?
3. What is meant by directionality of LASER?
4. Explain the different applications of LASER.
5. What is optical Pumping?
6. Write down the short notes on population inversion.

LONG ANSWER QUESTIONS (10 Marks each)

1. Describe the principles of LASER.
2. Describe the properties and uses of LASER.
3. Write short notes on:
   (i) Ground wave
   (ii) Sky wave
   (iii) Space wave