



## SOLUTION

1. NTA Ans. (1)

Sol. Magnetic energy stored per unit volume is

$$\frac{B^2}{2\mu_0} \Rightarrow \text{Dimension is } ML^{-1} T^{-2}$$

2. NTA Ans. (BONUS)

Sol.  $v_0 = h^x c^y G^z A^w$ 

$$\frac{ML^2T^{-2}}{AT} = (ML^2T^{-1})^x (LT^{-1})^y (M^{-1}L^3T^{-2})^z A^w$$

$$\Rightarrow w = -1$$

$$(x - z = 1)$$

$$2x + y + 3z = 2$$

$$-x - y - 2z = -3$$

$$2x = 0$$

$$x = 0$$

$$z = -1$$

$$2 \times 0 + y + 3(-1) = 2$$

$$y = 5 \Rightarrow v_0 = h^0 c^5 G^{-1} A^{-1}$$

So Bonus

3. NTA Ans. (3)

Sol.  $[h] = M^1L^2T^{-1}$ 

$$[C] = L^1T^{-1}$$

$$[G] = M^{-1}L^3T^{-2}$$

$$[f] = \sqrt{\frac{M^1L^2T^{-1} \times L^5T^{-5}}{M^{-1}L^3T^{-2}}} = M^1L^2T^{-2}$$

4. Official Ans. by NTA (1)

Sol.  $Y = F^x A^y V^z$ 

$$M^1L^{-1}T^{-2} = [MLT^{-2}]^x [L^2]^y [LT^{-1}]^z$$

$$M^1L^{-1}T^{-2} = [M]^x [L]^{x+2y+z} [T]^{-2x-z}$$

comparing power of ML and T

$$x = 1 \dots (1)$$

$$x + 2y + z = -1 \dots (2)$$

$$-2x - z = -2 \dots (3)$$

after solving

$$x = 1$$

$$y = -1$$

$$z = 0$$

$$Y = FA^{-1}V^0$$

5. Official Ans. by NTA (2)

Sol. Let  $[E] = [P]^x [A]^y [T]^z$ 

$$ML^2T^{-2} = [MLT^{-1}]^x [L^2]^y [T]^z$$

$$ML^2T^{-2} = M^x L^{x+2y} T^{-x+z}$$

$$\rightarrow x = 1$$

$$\rightarrow x + 2y = 2$$

$$1 + 2y = 2$$

$$y = \frac{1}{2}$$

$$\rightarrow -x + z = -2$$

$$-1 + z = -2$$

$$z = -1$$

$$[E] = [PA^{1/2} T^{-1}]$$

6. Official Ans. by NTA (4)

Sol.  $S = \frac{P}{A} = \frac{ML^2T^{-3}}{L^2} = MT^{-3}$ 

7. Official Ans. by NTA (3)

Sol.  $x = \frac{IFV^2}{WL^4}$ 

$$[x] = \frac{[ML^2][MLT^{-2}][LT^{-1}]^2}{[ML^2T^{-2}][L]^4}$$

$$[x] = [ML^{-1}T^{-2}]$$

$$[\text{Energy density}] = \left[ \frac{E}{V} \right]$$

$$= \left[ \frac{ML^2T^{-2}}{L^3} \right]$$

$$= [ML^{-1}T^{-2}]$$

Same as x

8. Official Ans. by NTA (2)

Sol.  $x = \frac{1}{\sqrt{\mu_0 \epsilon_0}} = \text{speed} \Rightarrow [x] = [L^1T^{-1}]$ 

$$y = \frac{E}{B} = \text{speed} \Rightarrow [y] = [L^1T^{-1}]$$

$$z = \frac{\ell}{RC} = \frac{\ell}{\tau} \Rightarrow [z] = [L^1T^{-1}]$$

So, x, y, z all have the same dimensions.