ALLEN CAREER INSTITUTE KOTA (RAJASTHAN)

DISTANCE LEARNING PROGRAMME
(Academic Session : 2024 - 2025)

JEE (Main)
UNIT TEST # 08
10-11-2024

# JEE(Main) : LEADER TEST SERIES / JOINT PACKAGE COURSE

## ANSWER KEY

### PART-1 : PHYSICS

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SECTION-I | Q. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| | A. | C | A | C | D | B | C | D | A | D | A |
| | Q. | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| | A. | A | B | D | B | C | B | C | B | D | C |
| SECTION-II | Q. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| | A. | 1 | 3 | 2 | 10 | 4 | 90 | 2 | 887 | 200 | 16 |

### PART-2 : CHEMISTRY

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SECTION-I | Q. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| | A. | D | D | D | B | B | C | A | C | D | C |
| | Q. | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| | A. | D | B | A | D | B | B | B | C | C | D |
| SECTION-II | Q. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| | A. | 2 | 4 | 3 | 5 | 9 | 4 | 34 | 4 | 1 | 9 |

### PART-3 : MATHEMATICS

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SECTION-I | Q. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| | A. | B | D | C | B | C | A | A | A | A | B |
| | Q. | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| | A. | B | D | B | A | D | A | C | A | B | A |
| SECTION-II | Q. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| | A. | 2 | 39 | 8 | 26 | 45 | 800 | 62 | 5 | 14 | 0 |

## HINT – SHEET

## PART-1 : PHYSICS

### SECTION-I

**1. Ans ( C )**

$P_{av} = V_{rms}\, i_{rms} \cos\phi$

**2. Ans ( A )**

When 100 V D.C. apply

$I = \frac{V}{R_{coil}} = \frac{100}{R_{coil}} = 1 \;;\; R_{coil} = 100\Omega$

When 100 V A.C. of 50 Hz apply then $I = \frac{1}{2}A$

$z = \frac{100}{\frac{1}{2}} = 200 \;;\; z = \sqrt{R_{coil}^2 + \omega^2 L^2}$

$200 = \sqrt{(100)^2 + \omega^2 L^2} \;;\; L = \frac{\sqrt{3}}{\pi} H$

**3. Ans ( C )**

$\tan\phi = \frac{X_L}{R}$

**5. Ans ( B )**

$V^2 = V_R^2 + V_C^2$

**6. Ans ( C )**

$f = \frac{1}{2\pi\sqrt{LC}}, f' = \frac{1}{2\pi\sqrt{1.25L \times 0.8C}}$

**7. Ans ( D )**

$\eta = \frac{V_s i_s}{V_p i_p} \times 100 = \frac{100 \times 100}{220 \times 0.5}$

**8. Ans ( A )**

Resonant frequency, $\omega_R = \frac{1}{\sqrt{(LC)}}$

$= \frac{1}{\sqrt{(10 \times 10^{-3}H) \times (1 \times 10^{-6}F)}} = 10^4$ per sec

The frequency 10% lower than this is

$w = 104 - 104 \times \frac{10}{100} = 9 \times 10^3$ per sec.

At this frequency, we have

$X_L = \omega L = 9 \times 10^3 \times (10 \times 10^{-3}) = 90$ ohm

$X_C = \frac{1}{\omega c} = 111.11\Omega,$

$Z = \sqrt{R^2 + (X_L - X_C)^2} = 21.32\Omega$

$i_0 = \frac{V_0}{Z} = 0.704A, \cos\phi = \frac{R}{Z} = 0.141$

$P_{av} = \frac{V_0 i_0}{2} \cos\phi$

$= \frac{1}{2} \times 15 \times 0.704 \times 0.141 = 0.744$ W

**9. Ans ( D )**

$X_L = X_C$

**10. Ans ( A )**

$ms\Delta\theta = i^2Rt, I = \frac{V}{Z}$

$2 \times 10 = i^2 \times 100 \times t$

**11. Ans ( A )**

$U = \frac{1}{2} \times F \times l = \frac{1}{2} \times 200 \times 10^{-3} = 0.1$ J

**12. Ans ( B )**

$Y = \frac{8g \times 2.5}{\left(\frac{15.6 \times 10^{-3}}{7800 \times 2.5}\right) 1.25 \times 10^{-3}}$

$Y = \frac{8 \times 10 \times 2.5 \times 7800 \times 2.5}{15.6 \times 10^{-6} \times 1.25}$

$Y = 4 \times 10^{10} \times 5$

**13. Ans ( D )**

Let the length of the pendulum at 0°C and t°C is $l_0$ and $l_t$ respectively.

The time period of oscillations of the pendulum is given by

$T = 2\pi\sqrt{\frac{l}{g}}$ i.e., $T \propto \sqrt{l}$

$\frac{T_t}{T_0} = \sqrt{\frac{l_t}{l_0}} = \sqrt{\frac{l_0(1+\alpha t)}{l_0}} = \sqrt{1+\alpha t}$

$= (1+\alpha t)^{1/2} = 1 + \frac{1}{2}\alpha t$

$\frac{T_t}{T_0} - 1 = \frac{1}{2}\alpha t$

$\frac{T_t - T_0}{T_0} = \frac{1}{2}\alpha t$

This is the time loss per second.

Thus, time loss per day

$= \frac{1}{2}\alpha t \times 24 \times 60 \times 60 = \frac{1}{2}\alpha t \times 86400$ s

**14. Ans ( B )**

$VT^2 =$ constant

$\frac{d}{dT}(VT^2) = 0$

$V2T + T^2\frac{dV}{dT} = 0$

$\gamma = \frac{dV}{V\,dT} = -\frac{2}{T}$

**15. Ans ( C )**

Heat gained by ice = heat lost by copper

$m \times 3.5 \times 10^5 = 2 \times 400 \times (500 - 0)$

where, m is the mass of ice melts

Thus, $m = \frac{2 \times 400 \times 500}{3.5 \times 10^5} = \frac{8}{7}$kg

**16. Ans ( B )**

$1 \times 540 + 1 \times 1 \times 100 = 640$ cal

640 cal = m × 80

m = 8 gm

17. **Ans ( C )**

On heating the system, thermal expansion occurs i.e. radius, diameter and gap all increases.

18. **Ans ( B )**

$H = H_1 + H_2$

$= \frac{200 \times 10^{-4}}{1}(60-20) + \frac{390 \times 10^{-4}}{1}(60-20)$

$= 0.8 + 1.56 = 2.36$ J

19. **Ans ( D )**

$\frac{Q}{t} = \frac{KA\Delta\theta}{l} \Rightarrow \frac{K_A}{K_B} = \frac{A_B}{A_A}$

$= \left(\frac{r_B}{r_A}\right)^2 = \frac{1}{4} \Rightarrow K_A = \frac{K_B}{4} \Rightarrow K_A = \frac{K_B}{4}$

20. **Ans ( C )**

$K = \frac{2K_1K_2}{K_1+K_2} = \frac{2.K.2K}{K+2K} = \frac{4}{3}K$

## PART-1 : PHYSICS

### SECTION-II

1. **Ans ( 1 )**

L ⟶ Removed, $\tan\frac{\pi}{3} = \frac{X_C}{R}$

$X_C = R\sqrt{3}$

C ⟶ Removed, $\tan\frac{\pi}{3} = \frac{X_L}{R}$

$X_L = R\sqrt{3}$

$\therefore X_L = X_C$

$\therefore Z = R$

$\therefore \cos\phi = \frac{R}{Z} = 1$

2. **Ans ( 3 )**

At angular frequency ω, the current in RC circuit is given by

$I_{rms} = \frac{V_{rms}}{\sqrt{R^2 + \left(\frac{1}{\omega c}\right)^2}}$ …(i)

Also $\frac{I_{rms}}{2} = \frac{V_{rms}}{\sqrt{R^2 + \left(\frac{1}{\frac{\omega}{3}c}\right)^2}} = \frac{V_{rms}}{\sqrt{R^2 + \frac{9}{\omega^2c^2}}}$ …(ii)

from (i) and (ii)

$\frac{x_c}{R} = \sqrt{\frac{3}{5}}$

3. **Ans ( 2 )**

$V = \sqrt{V_R^2 + (V_L - V_C)^2}$

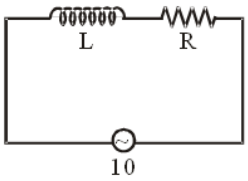
$= \sqrt{V_R^2 + (3V_R - 2V_R)^2} = \sqrt{2}V_R$

4. **Ans ( 10 )**

$V_L = V_C = V_R = 10 \Rightarrow X_L = X_C = R$

$V_{source} = 10V$

$V_L = i\,X_L$




5. **Ans ( 4 )**

$Z = \sqrt{R^2 + X_C^2}$

6. **Ans ( 90 )**

Bulk modulous

$K = \frac{P}{\Delta V/V}$ Here $\frac{\Delta V}{V} \times 100 = 0.1$

$\frac{9 \times 10^8}{1} = \frac{2gh \times 100}{0.1}$ $\rho = 1000$ kg/m$^3$

$\Rightarrow h = 90$ m $\quad g = 10$ m/s$^2$

7. **Ans ( 2 )**

$$\gamma = \frac{\Delta V}{V\,t}$$

Given $\frac{\Delta V}{V} = 0.12\%$ or $0.0012$

$$\gamma = \frac{0.0012}{20} = 6 \times 10^{-5}/C$$

Since $\alpha = \frac{\gamma}{3} = 2 \times 10^{-5}/°C$

8. **Ans ( 887 )**

$$\frac{E}{t} = s\,AT^4$$

$$= 6 \times 10^{-8} \times 1.6 \times 310^4$$

$$= 9.6 \times 10^{-8} = 887$$

9. **Ans ( 200 )**

$$\frac{T_2}{T_1} = \frac{\lambda m_1}{\lambda m_2} = \frac{1.75}{14.35} = T_2 = \frac{1.75}{14.35} \times 1640 = 200K$$

10. **Ans ( 16 )**

Area under given curve represents emissive power and emissive power $\propto T^4 \Rightarrow A \propto T^4$

$$\Rightarrow \frac{A_2}{A_1} = \frac{T_2^4}{T_1^4} = \frac{(273+327)^4}{(273+27)^4} = \left(\frac{600}{300}\right)^4 = \frac{16}{1}$$

## PART-2 : CHEMISTRY

### SECTION-I

1. **Ans ( D )**

$Cl^-$ ion gives positive chromyl chloride test

$$Fe^{+3} + K_4[Fe(CN)_6] \rightarrow Fe_4[Fe(CN)_6]_3$$

Prussian blue

2. **Ans ( D )**

$$Ni^{+2} + 2DMG \rightarrow \underset{\text{Rosy red}}{[Ni(DMG)_2]}$$

3. **Ans ( D )**

(A) $5SO_3^{-2} + 2MnO_4^- + 6H^+ \rightarrow 2Mn^{+2} + 5SO_4^{-2} + 3H_2O$

(B) $2MnO_4^- + 5NO_2^- + 6H^+ \rightarrow 2Mn^{+2} + 5NO_3^- + 3H_2O$

(C) $2MnO_4^- + H_2S + 6H^+ \rightarrow 2Mn^{+2}, 4Sd + 8H_2O$

4. **Ans ( B )**

$$4NaCl + K_2Cr_2O_7 + 3H_2SO_4 \longrightarrow \underset{\substack{\text{Chromyl chloride}\\ \text{orange red colour}}}{2CrO_2Cl_2\uparrow} + 2Na_2SO_4 + K_2SO_4 + 3H_2O$$

5. **Ans ( B )**

$I^- + H_2SO_4(Conc) \rightarrow I_2$ (Violet vapours)

6. **Ans ( C )**

$$Na_2S + H_2SO_4 \rightarrow Na_2SO_4 + H_2S$$

$$(CH_3COO)_2Pb + H_2S \rightarrow \underset{\substack{\text{Black lead}\\ \text{sulphide}}}{PbS} + 2CH_3COOH$$

7. **Ans ( A )**

As, Sb, Sn are present in group II (B). Their sulphides are soluble in YAS.

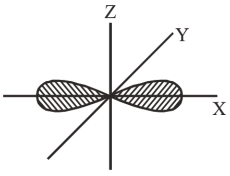
8. **Ans ( C )**

Brown ring test is performed for the qualitative detection of

9. **Ans ( D )**

$$\frac{\Delta R_1}{\Delta R_2} = \frac{(r_4 - r_3)_{4^{2+}}}{(r_4 - r_3)_{He^+}} = \frac{\frac{4^2}{3} - \frac{3^2}{3}}{\frac{4^2}{2} - \frac{3^2}{2}} = \frac{7/3}{7/2} = \frac{2}{3}$$

10. **Ans ( C )**




So, on x-axis $e^-$ density maximum

11. **Ans ( D )**

$$\left(\frac{e}{m}\right)_{Li^{+2}} = \frac{2}{7} = 0.28$$

$$\left(\frac{e}{m}\right)_{He^{+2}} = \frac{2}{4} = 0.50$$

$$\left(\frac{e}{m}\right)_{H^+} = \frac{1}{1} = 1.00$$

So $Li^{+2} < He^{+2} < H^+$

**12. Ans ( B )**

$r_1 \alpha \frac{n_1^2}{z_1}$ $\quad$ $r_2 \alpha \frac{n_2^2}{z_2}$

$z_1 = z_2 = 1$

$\frac{r_1}{r_2} = \left(\frac{n_1}{n_2}\right) = \left(\frac{1}{5}\right)^2 = \frac{1}{25}$

$\frac{r}{r_2} = \frac{1}{25}$

$\boxed{r_2 = 25\,r}$

**13. Ans ( A )**

$V_1 = 200$ $\quad$ $\lambda = \frac{h}{\sqrt{2m\,eV}}$

$V_2 = 50$ $\quad$ $\lambda \propto \frac{1}{\sqrt{V}}$

If we are concern about e– then mass and

charge (e) are same

so $\lambda \propto \frac{1}{\sqrt{V}}$ $\Rightarrow$ $\frac{\lambda_1}{\lambda_2} = \sqrt{\frac{V_2}{V_1}} = \sqrt{\frac{50}{200}} = \frac{1}{2} = 1:2$

**14. Ans ( D )**

n = 3, max$^m$. No. of $e^- = 2n^2 = 2 \times 3^2 = 18$

9 clockwise, 9 anticlockwise

**15. Ans ( B )**

$x = \frac{n_1^2}{R_2^2} = \frac{1}{R}$,

for Balmer $n_1 = 2$, n2 = 3

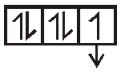
$\lambda = \frac{1}{R}\left[\frac{4 \times 9}{9-4}\right] = \frac{36}{5}$

**16. Ans ( B )**

$\Psi_{n\ell m} = \Psi_{310}$ $\left.\begin{matrix} n=3 \\ \ell=1 \\ m=0 \end{matrix}\right\}$ $3p_z$

**17. Ans ( B )**

Cl (17) = $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5$



n = 3, $\ell$ = 1, m = +1,O, – 1, s = –1/2 or + 1/2

**18. Ans ( C )**

$\ell$ = 3, for f orbital

**19. Ans ( C )**

$\Delta E = E_3 - E_2 = 47.2$

$\Delta E = E_3 - E_2 = 1.89$ (For H atom)

$= 47.2 = Z^2\,(1.89)$

$Z^2 = \frac{47.2}{1.89} \Rightarrow Z = 5$

**20. Ans ( D )**

Order of frequency & energy Lyman > Balmer >

Paschen > .....

## PART-2 : CHEMISTRY

### SECTION-II

**1. Ans ( 2 )**

Ag+ and $Pb^{2+}$ forms white ppt of AgCl and $PbCl_2$

**2. Ans ( 4 )**

$Cl_2$ ⟶ Greenish yellow

$NO_2$ ⟶ Brown gas

CdS ⟶ Yellow

$Cu_2[Fe(CN)_6]$ ⟶ Chocolate brown

**3. Ans ( 3 )**

$NH_4^+$ ⟶ Zero group

$Al^{+3}$ ⟶ III-group

$Zn^{+2}$, $Mn^{+2}$, $Ni^{+2}$ ⟶ IV-group

$Ca^{+2}$ ⟶ V-group

$Pb^{+2}$ ⟶ I-group

**4.** **Ans ( 5 )**

$Pb(NO_3)_2 \longrightarrow PbO + NO_2 + O_2$

$Fe(NO_3)_2 \longrightarrow Fe_2O_3 + NO_2 + O_2$

$Ag(NO_3)_2 \longrightarrow Ag + NO_2 + O_2$

$HNO_2 \longrightarrow H_2O + NO_2 + O_2$

$LiNO_3 \longrightarrow H_2O + NO_2 + O_2$

$NaNO_3 \longrightarrow NaNO_2 + O_2$

**5.** **Ans ( 9 )**

$6 \longrightarrow 1 \Rightarrow \underset{\text{U.V.}}{5} + \underset{\text{Visible}}{4} + \underbrace{3 + 2 + 1}_{\text{I.R.}}$

$5 + 4 = 9$

**6.** **Ans ( 4 )**

$v_n = \frac{v_1}{n}$

$v_1 = v$

$v_4 = \frac{v}{4} = \frac{v}{x} \Rightarrow x = 4$

**7.** **Ans ( 34 )**

Outormost/ultimate shell = $n^{th}$ shell

Penultimate orbit is $\Rightarrow (n-1)^{th}$ shell

Pre penultimate orbit is $\Rightarrow (n-2)^{th}$ shell

Kernel = Remaining part after removing outermost shell electrons

Al $\Rightarrow 1s^2\underline{2s^2 2p^6 3s^2 3p^1} \Rightarrow n = 3, (n-1) = 2 \Rightarrow 8e^- = x$

K $\Rightarrow \underline{1s^2 2s^2 2p^6 3s^2 3p^6}\ 4s^1 \Rightarrow n = 4 \Rightarrow 18e = y$

Zn $\Rightarrow 1s^2\underline{2s^2 2p^6} 3s^2 3p^6\ 4s^2 3d^{10} \Rightarrow 8e = z$

$n = 4^{th}, (n-1) = 3^{rd}, (n-2) = 2^{nd}$ shell

$8 + 18 + 8 = 34$

**8.** **Ans ( 4 )**

$\lambda = \frac{h}{mv}$

$\Rightarrow \lambda = 4.0 \times 10^{-33}$ cm

$\therefore\ x = 4$

**9.** **Ans ( 1 )**

$\Delta v = 90 \times \frac{5}{100} = 4.5$ m/s

$\Delta v.\ \Delta x = \frac{h}{4\pi m}$

$\Delta x = \frac{h}{4\pi m.\ \Delta v}$

$= \frac{6.63 \times 10^{-34}}{4 \times 3.14 \times 0.01 \times 4.5} = 1.17 \times 10^{-33}$

**10.** **Ans ( 9 )**

$K.E. = \frac{hc}{\lambda} = \phi = \frac{1240}{248} - 3.0eV = 2eV$

$\lambda_e = \frac{h}{\sqrt{2m(KE)}} = 9nm$

## PART-3 : MATHEMATICS

### SECTION-I

**1.** **Ans ( B )**

Let $T_{l+1}$ is max.

$T_{l+1} = \frac{^{100}c_r}{(r+1)(r+2)(r+3)(r+4)}$

$= \frac{^{104}c_{r+4}}{101\ .\ 102\ .\ 103\ .\ 104}$ is max, when

$r + 4 = 52$

$r = 48$

so term is $49^{th}$

**2.** **Ans ( D )**

$\left(7^{\frac{1}{7}} + 11^{\frac{1}{11}}\right)^{711}$

G.T $\Rightarrow {}^{711}C_r\ 7^{\frac{711-r}{7}}.11^{\frac{r}{11}}$

from rational term

r = 0,11,22,33,44.....

r = 4,11,18,25.....

common terms $\Rightarrow$ 11,88,.....

$11 + (n-1)77 \leqslant 711$

$n - 1 \leqslant 9.09$

$n \leqslant 10.09 \quad \Rightarrow$ 10 terms

**3. Ans ( C )**

Put $\boxed{x = i} \Rightarrow (1 + i + i^2)^5$

$= a_0 + a_1 i - a_2 - a_3 i + a_4 + a_5 i.....$

So $i^5 = (a_0 - a_2 + a_4....) + i(a_1 - a_3 + a_5....)$

$\therefore a_0 - a_2 + a_4.....= 0$ and $a_1 - a_3 + a_5.....= 1$

$\therefore (a_0 - a_2 + a_4.....)^2 + (a_1 - a_3 + a_5.....)^2 = 1$

**4. Ans ( B )**

Coefficient of

$x^5 = {}^5C_5 \cdot 5^5 + {}^6C_5 \cdot 5^5 + .....+ {}^{19}C_5 \cdot 5^5$

$\Rightarrow 5^5 ({}^5C_5 + {}^6C_5 + .....+ {}^{19}C_5)$

$\Rightarrow {}^{20}C_6 \cdot 5^5$

**6. Ans ( A )**

Here $5^{5^{5^{...5}}}$ (23 times) is odd natural number

so $x = 5^{2m+1} = 5(25)^m = 5(1+24)^m$ so remainder is 5

**8. Ans ( A )**

$1 \times 15 \times 15 \times 15 = 3375$

**9. Ans ( A )**

Vowels = A, A, I, U

Case 1 : $\boxed{A}$ – – – – $\boxed{A}$ $= \frac{|6}{|2}$

Case 2 : $\underset{1}{\boxed{A}}$ – – – – $\underset{2}{\boxed{I/U}}$ $= 2 \times \frac{|6}{|2}$

Case 3 : $\underset{2}{\boxed{I/U}}$ – – – – $\underset{1}{\boxed{A}}$ $= 2 \times \frac{|6}{|2}$

Case 4 : $\underset{2}{\boxed{I/U}}$ – – – – $\underset{1}{\boxed{I \text{ or } U}}$ $= 2 \times \frac{|6}{|2\,|2}$

$\Rightarrow 360 + 720 + 720 + 360 = 2160$

**12. Ans ( D )**

$\underset{\text{No. of ways}}{\underset{\longleftrightarrow}{4\ \ 4\ \ 3\ \ 3}}$ $\underset{10 \text{ cases}}{\vee}$ $\longrightarrow 10 \times 4 \times 4 \times 3 \times 3$ $= 1440$

**13. Ans ( B )**

$xyzw = 360 = 2^3.3^2.5^1$

${}^{3+4-1}C_{4-1} \times {}^{2+4-1}C_{4-1} \times {}^{1+4-1}C_{4-1}$

${}^6C_3 \times {}^5C_3 \times {}^4C_3 = 800$

So No. of Int. soln $= 16 \times 800 = 12800$

**14. Ans ( A )**

$\hat{a} + \hat{b} = \left(\frac{7i - 4j - 4k}{9}\right) + \left(\frac{-2\hat{i} - \hat{j} + 2\hat{k}}{3}\right)$

$= \frac{(7i - 4j - 4k) + (-6i - 3j + 6k)}{9} = \frac{i - 7j + 2k}{9}$

$\therefore$ Vector mag. $= 3\sqrt{6} \times \frac{3\sqrt{6}(i - 7j + 2k)}{\sqrt{54}}$

**18. Ans ( A )**

The vector $4\hat{i} + (4x - 2)\hat{j} + 2\hat{k}$ has magnitude double that of $\hat{i} + x\hat{j} + 3\hat{k}\hat{i} + x\hat{j} + 3\hat{k}$. Thus,

$\left|4\hat{i} + (4x - 2)\hat{j} + 2\hat{k}\right| = 2\left|\hat{i} + x\hat{j} + 3\hat{k}\right|$

$\Rightarrow 16 + (4x - 2)^2 + 4 = 4\,(1 + x^2 + 9)$

$\Rightarrow 12x^2 - 16x - 16 = 0$

$\Rightarrow 3x^2 - 4x - 4 = 0$

$\Rightarrow (3x + 2)\,(x - 2) = 0$

$\Rightarrow x = -\frac{2}{3}, 2$

$\Rightarrow x \in \left\{-\frac{2}{3}, 2\right\}$

**19. Ans ( B )**

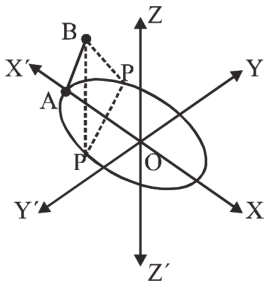
$|a - b|^2 + |b - c|^2 + |c - a|^2$

$= 2(a^2 + b^2 + c^2) - 2(a.b + b.c + c.a)$

$= 2 \times 3 - 2(a.b + b.c + c.a)$

$= 6 - \{(a + b + c)^2 - a^2 - b^2 - c^2\} = 9 - |a + b + c|^2 \leq 9.$

**20.** **Ans ( A )**




Point P lies on $x^2 + 3y^2 = 3$ ..(i)

Now from the diagram, according to the given conditions, AP = AB

or $\left(x + \sqrt{3}\right)^2 + (y - 0)^2 = 4$

or $\left(x + \sqrt{3}\right)^2 + y^2 = 4$ ..(ii)

Solving (i) and (ii), we get x = 0 and y = ± 1

Hence, point P has position vector $\pm \hat{j}$

## PART-3 : MATHEMATICS

### SECTION-II

**2.** **Ans ( 39 )**

$T_{13} = {}^{n}C_{12}(x^2)^{n-12}\left(\frac{2}{x}\right)^{12} \longrightarrow x^0$

power of x $\Rightarrow$ 2x − 36 = 0 $\Rightarrow$ $\boxed{n = 18}$

**M-I :** So sum of division of 18

$= 1 + 2 + 3 + 6 + 9 + 18 = 39$

**M-II :** $18 = 2^1 \times 3^2$

Sum of divisions of 18

$= (2^0 + 2^1)(3^0 + 3^1 + 3^2) = 39$

**3.** **Ans ( 8 )**

$2^{35}.3^{16}$

$= 8(4 \times 3)^{16}$

$= 8\,(11 + 1)^{16} = 8$

**6.** **Ans ( 800 )**

${}^{18}C_3 - {}^{16}C_1 = 816 - 16 = 800$

**7.** **Ans ( 62 )**

$\left({}^{5}C_2 \times 1\right) + \left({}^{4}C_2 \times 2\right) + \left({}^{5}C_1 \times {}^{4}C_1 \times 2\right)$

$10 + 12 + 40 = 62$

**8.** **Ans ( 5 )**

Let $\vec{a}$, $\vec{b}$, $\vec{c}$, $\vec{d}$ are (1, 1, 1), (−1, 1, 1)

(1, −1, 1), (−1, −1, 1) and rest of the vector are

$-\vec{a}$, $-\vec{b}$, $-\vec{c}$, $-\vec{d}$

Here 3 vectors will be coplanar if two will be collinear (anti parallel)

Number of ways of selecting two anti parallel pair = 4

Number of ways of selecting third vector = 6

Total number of ways = 24

Total number of ways of non coplaner selection

$= {}^{8}C_3 - 24 = 32 = 25$

**9.** **Ans ( 14 )**

$$\left|\frac{(\bar{x} \times \bar{y}) \cdot \bar{z}}{|\bar{z}|}\right| = \frac{\begin{vmatrix} 3 & -6 & 1 \\ 1 & 4 & -3 \\ 3 & -4 & -12 \end{vmatrix}}{\sqrt{9 + 16 + 144}} = 14$$

**10.** **Ans ( 0 )**

$(b - a) \cdot \left(c - \frac{a + b}{2}\right)$

$= b.c - b.\left(\frac{a + b}{2}\right) - a.c + \frac{a}{2}(a + b)$

and $|a - c| = |b - c| \Rightarrow |a - c|^2 = |b - c|^2$

$\therefore\ a + b = 2c$

Therefore, $(b - a).\left(c - \frac{a + b}{2}\right) = 0$