FIITJEE

ALL INDIA TEST SERIES

JEE (Advanced)-2025

FULL TEST – X

PAPER –2

TEST DATE: 07-05-2025

ANSWERS, HINTS & SOLUTIONS

Physics

PART – I

SECTION – A

1. B

Sol. Since current is

$$I = \vec{J}\cdot\vec{S} = JS = \sigma ES = KE^2 \cdot 4\pi r^2$$

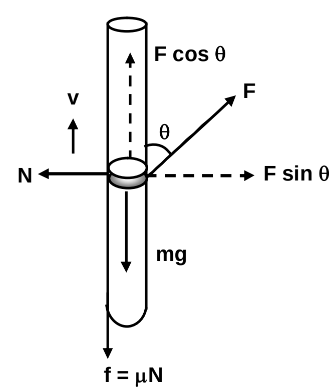
$$\therefore\ E = \frac{1}{r}\sqrt{\frac{I}{4\pi K}}$$

$$\text{Also, } V = -\int_b^a \vec{E}\cdot d\vec{r} = \sqrt{\frac{I}{4\pi K}}\,\ell n\left(\frac{b}{a}\right)$$

$$\therefore\ I = \frac{4\pi KV^2}{\left\{\ell n\left(\frac{b}{a}\right)\right\}^2}$$

2. A

Sol. $\theta = \omega t(\omega = \text{constant})$



$N = F \sin \omega t$

$$\frac{mdv}{dt} = (F\cos\omega t - \mu N - mg)$$

$$\int_0^0 mdv = \int_0^T (F(\cos\omega t - \mu\sin\omega t) - mg)dt$$

$$\frac{F}{\omega}[\sin\omega t + \mu\cos\omega t]_0^T = mgT$$

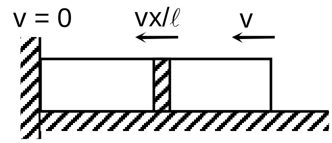
$$\therefore\quad \text{Also } \omega T = \frac{\pi}{2}$$

$$\therefore\quad F\left[\sin\frac{\pi}{2} + \mu\cos\frac{\pi}{2} - \mu\right] = mg\omega T$$

$$F[1-\mu] = mg\frac{\pi}{2} \qquad \therefore\ F = \frac{mg\pi}{2(1-\mu)}.$$

3. A

Sol. At any moment total energy of rod



E = K + U

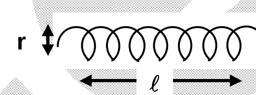
$= \int dk + \frac{1}{2}\frac{AY}{\ell}x^2$

$= \frac{1}{6}mv^2 + \frac{1}{2}\frac{AY}{\ell}x^2$

$\Rightarrow \frac{dE}{dt} = \frac{ma}{3} + \frac{AY}{\ell}x = 0$

$\Rightarrow \omega = \sqrt{\frac{3AY}{\ell m}}$

4. A



Sol. $L = \frac{\mu_0 N^2 \pi r^2}{\ell}$

Where N is total number of turns

Let total length of wire is ℓ_0.

Then $L = \frac{\mu_0 (2\pi r.N)^2 . \pi r^2}{4\pi\ell} = \frac{\mu_0 \ell_0^2}{4\pi\ell}$ …(i)

$R = \rho\frac{\ell_0}{A} = \rho.\frac{\ell_0^2}{V} = \frac{\rho\ell_0^2}{(m/d)} = \frac{\rho d.\ell_0^2}{m}$

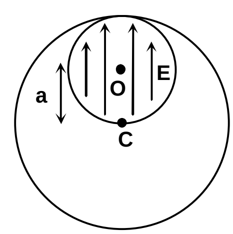
V is volume of the wire.

$\ell_0^2 = \frac{mR}{\rho d}$ …(ii)

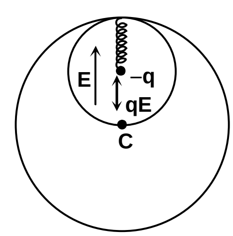
From (i) and (ii) $\tau = \frac{L}{R} = \frac{\mu_0 m}{4\pi\rho d\ell}$.

5. A, C

Sol. E in cavity is uniform and it is equal to $E = \frac{\rho a}{3\varepsilon_0}$



Time period of spring block system is independent of constant force so $T = 2\pi\sqrt{\frac{m}{k}}$



Work energy theorem

$qEX_{max} - \frac{1}{2}kX_{max}^2 = 0$

$X_{max} = \frac{2qE}{k} = \frac{2q}{k}\frac{\rho a}{3\varepsilon_0}$

$X_{max} = \frac{2\rho aq}{3\varepsilon_0 k}$

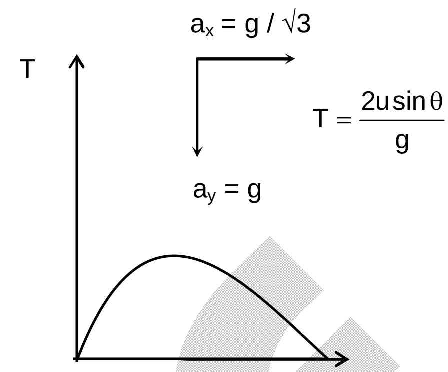
6. B, D

Sol. $R = u\cos\theta\dfrac{2u\sin\theta}{g} + \dfrac{1}{2}\dfrac{g}{\sqrt{3}}\left(\dfrac{2u\sin\theta}{g}\right)^2$

$= \dfrac{2u^2}{g}\left[\cos\theta\sin\theta + \dfrac{1}{\sqrt{3}}\sin^2\theta\right]$

$\dfrac{dR}{d\theta} = 0,\ \tan 2\theta = -\sqrt{3}$

$\theta = 60°$



7. A, C, D

Sol. $e = e_1 + e_2 = 200\sin\left(\omega t + \dfrac{\pi}{2}\right)$

$e_0 = 200$ volt

$v_5 = \dfrac{200}{\sqrt{2}} = 100\sqrt{2}$

$z = \sqrt{(500)^2 + (500)^2} = 500\sqrt{2}$

$i_{rms} = \dfrac{100\sqrt{2}}{500\sqrt{2}} = \dfrac{1}{5}$

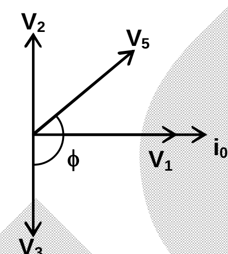
$V_1 = 500 \times \dfrac{1}{5} = 100$ volt

$V_2 = 900 \times \dfrac{1}{5} = 180$ volt

$V_3 = 400 \times \dfrac{1}{5} = 80$ volt

$V_4 = V_2 - V_3 = 100$ volt

$\phi = \dfrac{\pi}{2} + \tan^{-1}\left(\dfrac{9}{5}\right)$



SECTION – B

8. 60

Sol. For mirror formula

$\dfrac{1}{v} + \dfrac{1}{u} = \dfrac{1}{f}$

$\dfrac{1}{20/3} + \dfrac{1}{-20} = \dfrac{1}{f} \Rightarrow f = 10$ cm

Also, $-\dfrac{1}{f} = \dfrac{2}{f_e} - \dfrac{1}{f_m}$

$\Rightarrow -\dfrac{1}{10} = \dfrac{2}{30} - \dfrac{1}{f_m}$

$\Rightarrow f_m = 30$ cm

$\therefore$ R= 60 cm

9. 5

Sol. $v_{max} = A\omega \sin\phi$

$\frac{6\lambda}{2} = 1.2 \Rightarrow \lambda = 0.4$ m

$v = \sqrt{\frac{T}{\mu}} = \sqrt{\frac{320}{0.2}} = 40$ m/s

$v = f\lambda \Rightarrow f = \frac{40}{0.4} = 100$ Hz

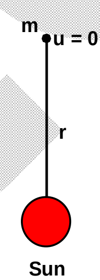
$\omega = 2\pi f = 2\pi(100) = 200\pi$

$\phi = \frac{2\pi}{\lambda}\Delta x = \frac{2\pi}{(0.4)}\left(\frac{1}{30}\right) = \frac{2\pi}{12} = \frac{\pi}{6}$

$v_{max} = (0.25 \times 10^{-2})(200\pi)\sin\left(\frac{\pi}{6}\right) = \frac{0.50}{2}\pi = 0.25\pi$ m/s = 25π cm/s

10. 4

Sol. $a = \frac{r+0}{2} = \frac{r}{2}$



Using Kepler's law

$\frac{T}{T_0} = \left(\frac{r/2}{r}\right)^{3/2}$

$T = \frac{T_0}{2\sqrt{2}}$

The time taken by the body to fall on the surface of sun,

$\tau = \frac{T}{2} = \frac{T_0}{4\sqrt{2}}$

$\tau = \frac{T_0}{4\sqrt{2}}$

Hence, n = 4

11. 4

Sol. Path difference, $\Delta r = \left(SA + AP + \frac{\lambda}{2}\right) - SP = 2x + \frac{\lambda}{2}$

For maxima, $2x + \frac{\lambda}{2} = n\lambda$

$x = \lambda/4$

12. 4

Sol. $Y = \frac{FL}{A\ell}$

Here measurement is for ℓ only,

So, $\frac{\Delta Y}{Y} = \frac{\Delta \ell}{\ell}$

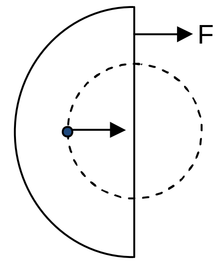
From observation, ℓ_1 = MS + 20(LC), and ℓ_2 = MS + 45(LC)

Change in length = $\ell_2 - \ell_1$ = 25 × LC, and the maximum permissible error in measurement of elongation in one LC.

$\frac{\Delta Y}{Y} \times 100\% = \frac{1}{25}\frac{LC}{(LC)} \times 100\% = 4\%$

13. 3

Sol. $F = \left(\frac{m}{2}\right)\omega^2 \frac{3r}{8} = \frac{3mv^2}{16r}$

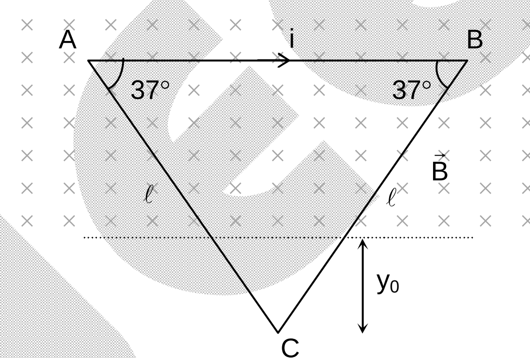


SECTION – C

14. 10.00

15. 6.28

Sol. **(for Q. 14-15)**



$i\left(\frac{8y_0}{3}\right)B = mg$

$y_0 = \frac{3mg}{8iB}$

$y_0 = 10$

If loop is displaced by small y downward. Then,

$ma = mg - iB\left[\frac{8}{3}(y + y_0)\right]$

$a = -\left(\frac{8iB}{3m}\right)y$

$\omega = \sqrt{\frac{8iB}{3m}}$

$T = \frac{2\pi}{\omega} = 2\pi$

16. 1.69

17. 10.48

Sol. **(for Q. 16-17)**

Using conservation of energy

$(m \times 540) + m \times 1 \times (100 - 20) = (M \times 80) + M \times 1 \times (20 - 0)$

$\Rightarrow M = 6.2\,m$ …(i)

$(0.2 \times 540) + 0.2 \times 1 \times (100 - 30) = (M + m) \times 1 \times (30 - 20)$

$\Rightarrow M + m = 12.2$

Solving equations

m = 1.69 kg

M = 10.48 kg

Chemistry

PART – II

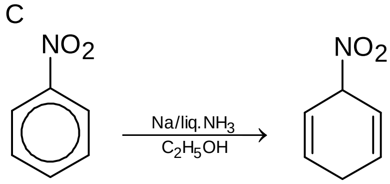
SECTION – A

18. D

Sol. It is an example of anti elimination via E_2 mechanism. Hence, meso gives trans alkene.

19. C

Sol.



20. C

Sol.

$$CrCl_3 + NaOH \longrightarrow Cr(OH)_3 \downarrow + NaCl(soln)$$

$$Cr(OH)_3 \xrightarrow{H_2O_2/NaOH} \underset{\text{yellow solution}}{Na_2CrO_4} \xrightarrow{AgNO_3} \underset{\text{brick red ppt.}}{Ag_2CrO_4 \downarrow}$$

$$NaCl(soln) \xrightarrow{Hg_2(NO_3)_2} \underset{\text{white ppt.}}{Hg_2Cl_2} \xrightarrow{NH_3} \underbrace{Hg + Hg(NH_2)Cl}_{\text{Shiny black ppt.}}$$

21. A

Sol. Nodal plane in 5d orbital are

$n - \ell - 1 = 5 - 2 - 1 = 2$

22. A, B, C

Sol. E^o_{cell} , E_{cell} and normality are intensive property, where as entropy is extensive property.

23. B, C

Sol. $[\pi_{obs}]_{0.4\ M\ NaCl} = i \times C \times R \times T$

$= i \times 0.4 \times R \times T$

$= [1 + (n-1)\alpha] \times 0.4 \times R \times T$

$= [1 + 0.8] \times 0.4 \times R \times T$

$= 1.8 \times 0.4 \times R \times T$

= 0.72 RT

$[\pi_{obs}]_{0.3\ M\ Na_3PO_4} = [1 + (4-1) \times 0.9] \times 0.3 \times R \times T$

= 1.11 RT

$[\pi_{obs}]_{0.7\ M\ Glucose} = 0.7 \times R \times T$

= 0.7 RT

$[\pi_{obs}]_{1MH-\overset{O}{\overset{\|}{C}}-OH} = [1 + (2-1)0.3] \times R \times T$

$= 1.3 \times R \times T$

$[\pi_{obs}]_{0.5\ M\ MgCl_2} = 0.5 \times R \times T[1 + (2) \times 0.2]$

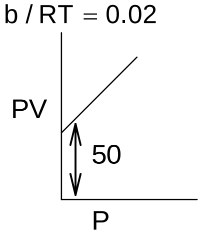
$= R \times T \times 0.5[1.4]$
= 0.7 RT
Here only option (B) and (C) have greater osmotic pressure then given solution.

24. A, B, C, D
Sol. In isothermal ideal gas compression as volume decrease. Hence, W is +ve, ΔH is zero, ΔS_{gas} is – ve and ΔE is zero

SECTION – B

25. 2
Sol. $\left[Pt(NH_3)_4\right][PtCl_4]$ and $\left[Pt(NH_3)_3 Cl\right][PtCl_3NH_3]$

26. 5
Sol. $Z = 1 + \frac{Pb}{RT}$
$b / RT = 0.02$



$PV = nRT = 50$
$\therefore 2RT = 50$
RT = 25
$\therefore b = 0.02 \times 25 = 0.5$
Excluded volume for 10 moles = 10 × 0.5 = 5

27. 9
Sol.
$$3x_2(g) \rightleftharpoons x_6(g), \quad K_p = 1.6 \text{ atm}^{-2}$$
$$2a - x - z \qquad \frac{x}{3}$$
$$x_2(g) + y(g) \rightleftharpoons x_2y(g), \quad K_P = W \text{ atm}^{-1}$$
$$2a - x - z \qquad a - z \qquad z$$
$$\frac{x}{3} = 0.2 \Rightarrow x = 0.6$$
$$1.6 = \frac{P_{X_6}}{\left[P_{X_2}\right]^3} \Rightarrow \left[P_{X_2}\right]^3 = \frac{0.2}{1.6}$$
$$P_{X_2} = \frac{1}{2} = 0.5 \text{ atm}$$
Now, 0.5 + 0.2 + a – z + z = 1.4
a = 0.7
2a – x – z = 0.5
$\Rightarrow 2 \times 0.7 - 0.6 - 0.5 = z$
$z = 0.3$
$$K_P = W = \frac{0.3}{0.5 \times [0.7 - 0.3]} = 1.5$$
Hence, 6W = 6 × 1.5 = 9

28. 2
Sol. Molality = m, molarity = M, density = d, molar mass of solute m'

$$m = \frac{1000M}{1000\,d - Mm'}$$

$$2.273 = \frac{1000 \times 4.0}{1000\,d - 4 \times 60}$$

$$d = 2.0 \text{ gm / ml}$$

29. 2
Sol. $a - 2R = 1.35$

$$\sqrt{3}a = 4R$$

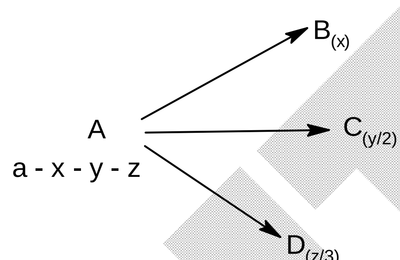
$$a - \frac{1.73}{2}a = 1.35$$

$$\therefore a = \frac{1.35}{0.135} = 10\ \overset{o}{A} = 10 \times 10^{-8}\ \text{cm}$$

$$\text{Density } = \frac{z \times m}{a^3 \times N_{av}}$$

$$= \frac{2 \times 600}{\left(10 \times 10^{-8}\right) \times 6 \times 10^{23}} = 2 \text{ gm / ml}$$

30. 8
Sol.



$$\therefore \frac{-d[A]}{dt} = \frac{dx}{dt} + \frac{dy}{dt} + \frac{dz}{dt}$$

$$= \frac{d[B]}{dt} + \frac{1}{2}\frac{d[C]}{dt} + \frac{1}{3}\frac{d[z]}{dt}$$

$$= \lambda_1[A] + 2\lambda_2[A] + 3\lambda_3[A]$$

$$\lambda = \left(60 \times 10^{-3}\right) + 2\left(25 \times 10^{-3}\right) + 3 \times 5 \times 10^{-3}$$

$$\lambda = 125 \times 10^{-3}$$

$$t_{avg.} = \frac{1}{\lambda} = \frac{1}{125 \times 10^{-3}} = 8 \text{ sec.}$$

SECTION – C

31. 1.00

32. 4.00
Sol. **(for Q. 31 to 32)**

$$\begin{array}{lll} P & \rightleftharpoons & Q \quad + \quad R \\ 2 & & 0 \qquad\quad 0 \\ 2-x & & x+y \quad x-y \end{array}$$

$$\begin{array}{lll} R & \rightleftharpoons & S \quad + \quad Q \\ x & & 0 \qquad\quad 0 \\ x-y & & y \qquad\quad y+x \end{array}$$

$2-x+x+y+x-y+y=4$

$x+y=2$

$\dfrac{x-y}{x+y}=\dfrac{1}{5}; y=\dfrac{2}{3}x$

Hence, $x=1.2$

$y=0.8$

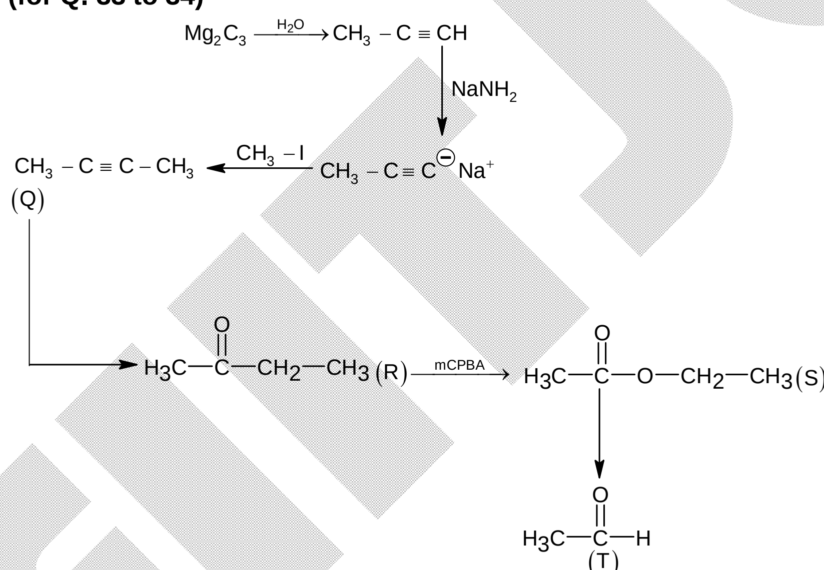
$$K_{C_1}=W=\frac{(x-y)(x+y)}{2-x}=\frac{2\times 0.4}{0.8}=1$$

$$K_{C_2}=Z=\frac{(x+y)(y)}{x-y}=\frac{2\times 0.8}{0.4}=4$$

33. 10.08

34. 3.44

Sol. **(for Q. 33 to 34)**



$\because [\text{Mass}]_{CH_3-C\equiv C-H}=10,\ [M]_{CH_3-C\equiv C-H=40\ \text{gram/mole}}$

$\therefore [\text{Mole}]_{CH_3-C\equiv CH}=\dfrac{10}{40}=\dfrac{1}{4}$

$\therefore \text{Mole of Q}=\dfrac{1}{4}\times\dfrac{70}{100}=\dfrac{7}{40}$

$\therefore \text{Mole of R}=\dfrac{7}{40}\times\dfrac{80}{100}$ $\qquad \therefore \text{Mass of R}=\dfrac{7}{40}\times\dfrac{80}{100}\times[72]$

$x=10.08\,g$

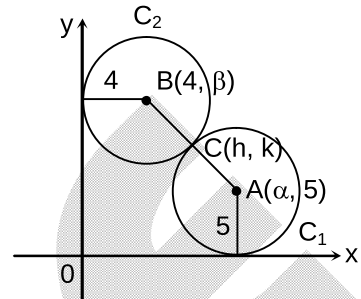
$\text{Mass of T}=\dfrac{7}{40}\times\dfrac{80}{100}\times\dfrac{80}{100}\times\dfrac{70}{100}\times[44]$

Mathematics PART – III

SECTION – A

35. B

Sol. C(h, k) divides AB into the ratio 5 : 4



$\therefore\ (h, k) = \left(\dfrac{4\alpha+20}{9}, \dfrac{5\beta+20}{9}\right)$

AB = 9 ⇒ $(\alpha-4)^2 + (\beta-5)^2 = 9^2$

$\Rightarrow \dfrac{(h-4)^2}{4^2} + \dfrac{(k-5)^4}{5^2} = 1$

Locus of point of contact is $\dfrac{(x-4)^2}{16} + \dfrac{(y-5)^2}{25} = 1$

We shift the axes to (4, 5), so that curve become $\dfrac{x^2}{16} + \dfrac{y^2}{25} = 1$ and point (9, 5) become (5, 0)

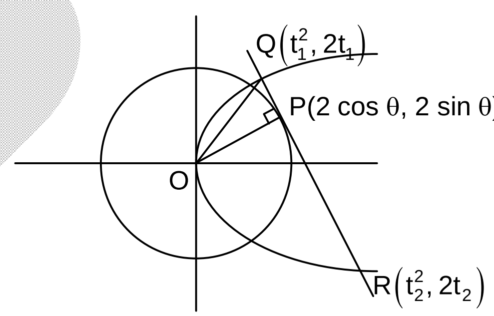
Chord of contact is $x = \dfrac{16}{5}$

Solving with conic, we get Q and R as $\left(\dfrac{16}{5}, \pm 3\right)$

$\therefore$ Area of ΔPQR = $\dfrac{27}{5}$

36. D

Sol. $OQ^2 = OP^2 + PQ^2$



$\Rightarrow t_1^2 + 4t_1^2 = 5$

$\Rightarrow t_1 = 1$ ($\because\ t_1 > 0$)

⇒ Q ≡ (1, 2)

PQ = 1 ⇒ cos θ + 2 sin θ = 2

$\Rightarrow \cos\theta = \dfrac{4}{5},\ \sin\theta = \dfrac{3}{5}$

$\Rightarrow P \equiv \left(\dfrac{8}{5}, \dfrac{6}{5}\right)$

Now R lies on tangent 4x + 3y = 10

$\Rightarrow t_2 = -\dfrac{5}{2}$ ($\because\ t_2 < 0$)

$\Rightarrow R \equiv \left(\dfrac{25}{4}, -5\right)$ and $S \equiv \left(-\dfrac{5}{2}, -\dfrac{3}{2}\right)$

37. D

Sol. Equation of tangent is $y = 4x \pm \sqrt{16a^2 + b^2}$ this normal passes through (–2, 0)

$\Rightarrow 0 = -8 \pm \sqrt{16a^2 + b^2}$; $64 = 16a^2 + b^2$

Giving AM ≥ GM

$\dfrac{16a^2 + b^2}{2} \ge \sqrt{16a^2b^2}$

$\dfrac{64}{2} \ge \sqrt{16a^2b^2}$

$4ab \le 32$

$ab \le 8$

38. C

Sol. $\frac{1}{3}\frac{d}{dx}\left\{e^{x^3}\left(y^3-1\right)\right\}+\frac{1}{3}\frac{d}{dx}\left(e^{y^3}\right)=0$

39. A, B, C

Sol. $\vec{p}+\vec{q}+\vec{r}=0$

So, $\vec{p},\vec{q},\vec{r}$ can form a triangle

$\vec{p}\cdot\vec{c}=\left(\vec{b}\cdot\vec{c}\right)\left(\vec{a}\cdot\vec{c}\right)-\left(\vec{c}\cdot\vec{a}\right)\left(\vec{b}\cdot\vec{c}\right)=0$

$\therefore\ \vec{p}\perp\vec{c}$

$\Rightarrow\ \vec{q}\perp\vec{a}$ and $\vec{r}\perp\vec{b}$

40. A, B

Sol. $\frac{\frac{\sqrt{3}-1}{2\sqrt{2}}}{\sin x}+\frac{\frac{\sqrt{3}+1}{2\sqrt{2}}}{\cos x}=2$

$\Rightarrow\ \sin\frac{\pi}{12}\cdot\cos x+\cos\frac{\pi}{12}\sin x=\sin 2x$

$\Rightarrow\ \sin\left(x+\frac{\pi}{12}\right)=\sin 2x$

$\Rightarrow\ x=\frac{\pi}{12}$ and $\frac{11\pi}{36}$

41. A, B, C

Sol. $\Rightarrow\left({}^{29}C_4+{}^{29}C_5\right)-\left({}^{29}C_5+{}^{29}C_6\right)+.....-\left({}^{29}C_{27}+{}^{29}C_{28}\right)={}^{29}C_4-29$

$\Rightarrow 3P={}^{29}C_4\Rightarrow P=3\times7\times13\times29$

${}^{Q}C_R={}^{104}C_{94}\Rightarrow Q=104,\ R=94$ or 10

SECTION – B

42. 6

Sol. $x^3-x^2-1=0\to\alpha,\beta,\gamma\Rightarrow\alpha^2+\beta^2+\gamma^2=1$

$\alpha^2+\beta^3+\gamma^4=\alpha^2+\beta^2+1+\gamma^3+\gamma=3+\gamma$

In given equation $x\to x-3\Rightarrow x^3-10x^2+33x-37=0$

43. 0

Sol. $a^3+b^3+c^3-3abc=(a+b+c)(a+\omega b+\omega^2c)(a+\omega^2b+\omega c)$

$a+b+c=e^x,\ a+b\omega+c\omega^2=e^{\omega x},\ a+b\omega^2+c\omega=e^{\omega^2x}$

44. 9

Sol. If even letters goes to even envelopes but none goes to correct envelop, then the number of ways

$=3!\left(1-\frac{1}{1!}+\frac{1}{2!}-\frac{1}{3!}\right)=2$

Now for $L_1\ L_2\ L_5\ L_7$

$E_1\ E_3\ E_5\ E_2$

Number of ways if L_7 does not to to $E_2=D_4=9$

Number of ways if L_7 goes to to $E_2=D_3=2$

Total = 11

$\Rightarrow$ Required ways $=11\times2=22=N$

45. 4

Sol. Put sin 2θ = x given equation becomes $x^4 + 1 = 17(1 + 2x + x^2)^2$

Divide by x^2, we have $x^2 + \frac{1}{x^2} = 17\left(x + \frac{1}{x} + 2\right)^2$

Now put $y = x + \frac{1}{x} \Rightarrow y = -\frac{7}{4}$ or $-\frac{5}{2}$

Now $y = -\frac{7}{4}$ have no solution and $y = -\frac{5}{2}$, we have $x = -\frac{1}{2}, -2$

So, there are (4) solution in [0, 2π]

46. 4

Sol. $f(x) = \frac{\ln(\{\sin x\}\{\cos x\}+1)}{\{\sin x\}\{\cos x\}}$

$f(0^-) = \frac{\ln(1\times1+1)}{1\times1} = \ln 2$

$f\left(\frac{\pi^+}{2}\right) = \frac{\ln(1\times1+1)}{1\times1} = \ln 2$

$f\left(\frac{\pi^-}{2}\right) = \lim_{h\to0}\frac{\ln(\{\cosh\}\{\sinh\}+1)}{\{\cosh\}\{\sinh\}} = \lim_{h\to0}\frac{\ln(\cosh\sinh+1)}{\cosh\sinh} = 1$

47. 5

Sol. AB = I

$(AB)C_1 = C_1$, $(AB)^2C_2 = C_2$ ..... and so on

$t_r(C_r) = r\cdot3^r + (r-1)\cdot3^r = (2r-1)3^r$

$\sum_{r=1}^{50} t_r\left((AB)^r C_r\right) = t_r\left((AB)C_1\right) + t_r\left((AB)^2 C_2\right) + ... + t_r\left((AB)^{50} C_{50}\right)$

$= t_r(C_1) + t_r(C_2) + ... + t_r(C_{50})$

$= 1\cdot3^1 + 3\cdot3^2 + 5\cdot3^3 + ... + 99\cdot3^{50}$ (AGP)

$\Rightarrow S = 3 + 49\cdot3^{51}$

$\therefore$ a + b = 100

SECTION – C

48. 12.00

49. 3.00

Sol. **(for Q. 48 to 49)**

$-7 \le \frac{(\sqrt{193}-1)}{2}\cos y + \cos\left(y + \frac{\pi}{3}\right) \le 7$

So; $g(x) = \begin{cases} |x+7| & ; \quad x \ge 0 \\ |x-7| & ; \quad x < 0 \end{cases}$

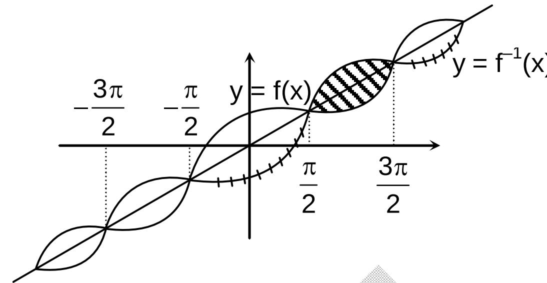
So; $g(x)_{min} = 7$

So; f(x) = x + cos x

48. $A = 3 \times 2 \int_{\pi/2}^{3\pi/2} \left(x - (x + \cos x)dx\right)$

$= -3 \times 2 (\sin x)_{\pi/2}^{3\pi/2}$

$= -6(-1 - 1) = 12$

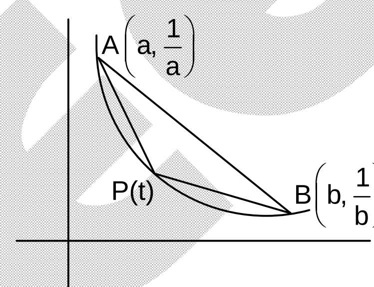


49. $2^x = x^2$ intersect at 3 points

50. 2.00

51. 1.00

Sol. **(for Q. 50 to 51)**



$A(t) = \frac{(a-b)(a-t)(b-t)}{2abt}$

$A'(t) = \frac{(a-b)(t^2 - ab)}{2abt^2}$

So, $t = \sqrt{ab}$ is point of maxima moreover

$\int_{a}^{\sqrt{ab}} \left(-\frac{1}{at}x + \frac{1}{a} + \frac{1}{t} - \frac{1}{x}\right)dx = \int_{\sqrt{ab}}^{b} \left(-\frac{1}{bt}x + \frac{1}{b} + \frac{1}{t} - \frac{1}{x}\right)dx$