FIITJEE
ALL INDIA TEST SERIES
JEE (Advanced)-2025
FULL TEST – III
PAPER –1
TEST DATE: 18-02-2025

ANSWERS, HINTS & SOLUTIONS

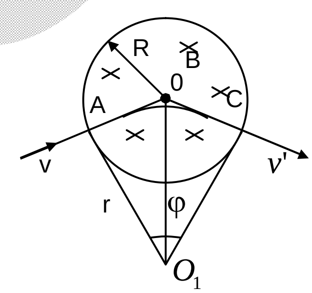
Physics

PART – I

SECTION – A

1. B

Sol. The magnetic induction of the solenoid is directed along its axis. Therefore, the Lorentz force acting on the electron at any instant of time will lie in the plane perpendicular to the solenoid axis. Since the electron velocity at the initial moment is directed at right angles to the solenoid axis, the electron trajectory will lie in the plane perpendicular to the solenoid axis. The Lorentz force can be found from the formula $F = evB$.



The trajectory of the electron in the solenoid is an arc of the circle whose radius can be deter mined from the relation $evB = mv^2/r$, whence

$$r = \frac{mv}{eB}$$

The trajectory of the electron in shown in figure, where O_1 is the centre of the arc AC described by the electron, v' is the velocity at which the electron leaves the solenoid. The segments OA and OC are tangents to the electron trajectory at points *A* and *C*. The angle between v and v' is obviously $\varphi = \angle AO_1C$ since $\angle OAO_1 = \angle OCO_1$.

In order to find φ, let us consider the right triangle OAO_1; side $OA = R$ and side $AO_1 = r$.

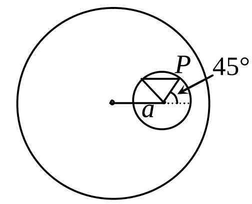
Therefore, $\tan(\varphi/2) = R/r = eBR/(mv)$.

Therefore, $$\varphi = 2\tan^{-1}\left(\frac{eBR}{mv}\right)$$

Obviously, the magnitude of the velocity remains unchanged over the entire trajectory since the Lorentz force is perpendicular to the velocity at any instant. Therefore, the transit time of electron in the solenoid can be determined from the relation

2. A

Sol. $F = eE = \dfrac{e\rho a}{3\varepsilon_0}$



$r\sqrt{2} = \dfrac{1}{2}\dfrac{F}{m}t^2$

$t = \sqrt{\dfrac{6\sqrt{2}r\varepsilon_0 m}{e\rho a}}$

3. D

Sol. $\mu(x) = a - bx$

where values of a and b are 2 and 1 respectively in SI unit.

4. C

5. A, B, C, D

Sol. At the time of maximum elongation angular speed of *B* and *C* are equal, let speed of *B* is 2*v* and *C* is v, By conserving angular momentum of the system about the centre

$mv_0 2R = m2v(2R) + mv(R)$

$v = \dfrac{2v_0}{5}$, $v_B = \dfrac{4v_0}{5}$, $v_C = \dfrac{2v_0}{5}$

Conserving energy of the system $\dfrac{1}{2}mv_0^2 = \dfrac{1}{2}kx_{\max}^2 + \dfrac{1}{2}m\left(\dfrac{4v_0}{5}\right)^2 + \dfrac{1}{2}m\left(\dfrac{2v_0}{5}\right)^2$

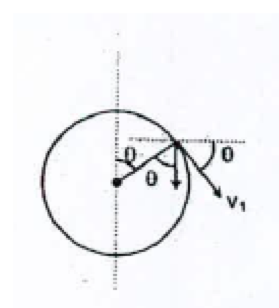
$\therefore \quad x_{\max} = \sqrt{\dfrac{m}{5k}}v_0$

6. A, B, C

Sol. Use Relative Motion w.r.t. Box.

7. A, B, C

Sol. $\vec{F} = (v_1\hat{i} + v_2\hat{k}) \times (A\hat{k}) = Av(-\hat{j})$



$\dfrac{mv^2}{R} = Av$

$R = \dfrac{mv}{A}$

$\omega = \dfrac{A}{m}$

$\vec{v} = v_1\cos\theta\hat{i} - v_1\sin\theta\hat{i} + v_2\hat{k}$

$\vec{v} = v_1\cos\left(\dfrac{A}{m}t\right)\hat{i} - v_1\sin\left(\dfrac{A}{m}t\right)\hat{j} + v_2\hat{k}$

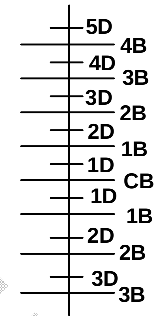
8. A

Sol. $\vec{dF} = i\left(\vec{d\ell} \times \vec{B}\right)$

$\vec{\tau} = i\vec{A} \times \vec{B}$

9. A

Sol. By using $(\mu-1)t = n\lambda$, we can find value of n, that is order of the fringe produced at P, if that particular strip has been placed over any of the slit. If two strips are used in conjunction (over each other), path difference due to each is added to get net path difference created. If two strips are used over different slits, their path differences are subtracted to get net path difference.



Now, $n_1 = \frac{(\mu_1 - 1)t_1}{\lambda} = 5$

$n_2 = 4.5$

and $n_3 = 0.5$

For (A), order of the fringe is 4.5 i.e. 5^{th} dark

For (B), net order is 5 – 0.5 = 4.5

i.e. fifth dark

For (C) net order is 5 – (0.5 + 4.5) = 0

i.e. it is central bright again at P.

For (D) net order is (5+0.5) – (4.5) = 1

i.e. first bright

10. A

Sol. $q_B = -q\left(1 - \frac{1}{K}\right)$

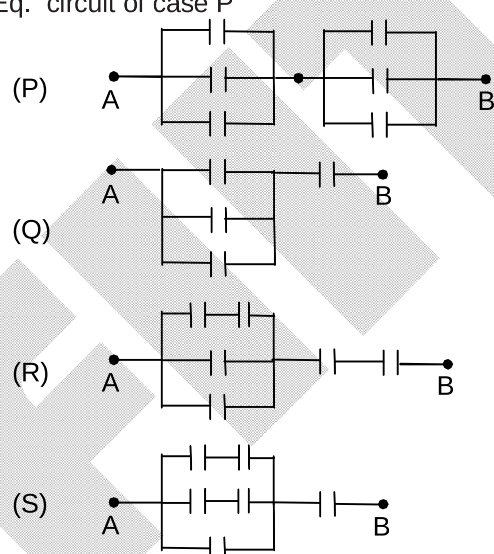
$q_A = +q$

$q_C = +q\left(1 - \frac{1}{K}\right)$

$q_D = -q$

11. B

Sol. Eq. circuit of case P



SECTION – B

12. 96

Sol. From the velocity component of object w.r.t. mirror is

$$\left(V_{OM}\right)_{||} = -\frac{v^2}{u^2}\left(V_{OM}\right)_{||} \Rightarrow \left(V_{OM}\right)_{||} = -\left(\frac{60}{-20}\right)^2(10) = -90\,m/s$$

$$\frac{dm}{dt} = -\left[\frac{u\left(V_{IM}\right)_{||} - \upsilon\left(V_{IM}\right)_{||}}{u^2}\right] = \left[\frac{(-20)\times 10^2(-90) - (60)\times 10^{-2}(10)}{\left(-20\times 10^{-2}\right)^2}\right] \text{ per sec.}$$

$$\frac{dm}{dt} = -3\times 10^2 \text{ per sec} \qquad \Rightarrow \left(V_{IM}\right)_{\perp} = h_0\frac{dm}{dt} + m\left(V_{OM}\right)_{\perp}$$

$$\left(V_{IM}\right)_{\perp} = 2\times 10^{-2}\times\left(-3\times 10^2\right) + (3)(-15) = -6 - 45 = -51\,m/s$$

$$\left(\vec{V}_{VM}\right)_{\perp} = \left(V_{IM}\right)_{||}\hat{i} + \left(V_{IM}\right)_{\perp}\hat{j}$$

$$\vec{V}_{IG} = \vec{V}_{IM} + \vec{V}_{MG}\left(-90\hat{i} - 51\hat{j}\right) + \left(-6\hat{i} + 10\hat{j}\right)$$

13. 2

Sol. $\Delta U_1 = mC_v\,\Delta t$

$= 1\times\frac{3}{2}R\,\Delta T$

$= \frac{3R\,\Delta T}{2}$

$\Delta U_2 = \frac{1}{2}k\left(x_2^2 - x_1^2\right)$

$PA = kx$

$x = \frac{PA}{k}$

$x^2 = \frac{P(Ax)}{k} = \frac{RT}{k}$

$\Delta U_2 = \frac{R}{2}(T_2 - T_1)$

$= \frac{R\Delta T}{2}$

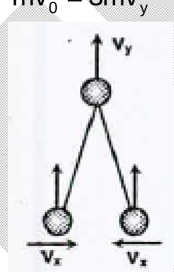
$\Delta U = \Delta U_1 + \Delta U_2 = 2R\Delta T$

$C = 2R$

14. 1

Sol. From collision

$mv_0 = 3mv_y$



$v_y = \frac{v_0}{3}$

From COE

$\frac{1}{2}mv_0^2 - 3\frac{1}{2}mv_y^2 + 2\frac{1}{2}mv_x^2$

$\frac{1}{2}mv_x^2\left(1 - 2\frac{v_0^2 2}{9}\right) = mv_x$

$$v_x = \frac{v_0}{\sqrt{3}}$$

From frame of ball B,

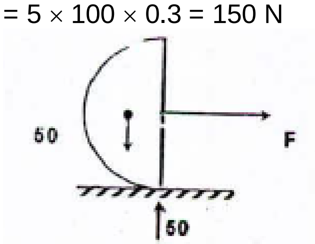
$$3T = \frac{mv_x^2}{\ell}$$

$$\therefore \qquad T = \frac{mv_x^2}{3\ell} = \frac{(3)(v_2^2)}{3\times3\times1} = 1$$

15. 5

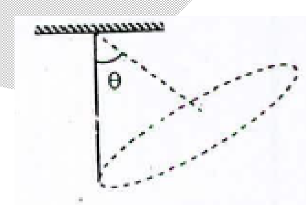
Sol. $F = \left(\frac{10}{2}\right)(10)^2 \times \frac{3\times0.8}{8}$

= 5 × 100 × 0.3 = 150 N



16. 3

Sol. $\omega = \sqrt{\frac{g_{eff}}{\ell\cos\theta}}$



$v = \omega r = \omega\ell\sin\theta$

$= \sin\theta\sqrt{\frac{\ell g_{eff}}{\cos\theta}}$

$\sin\theta = \frac{qE}{mg_{eff}}, \cos\theta = \frac{g}{g_{eff}} \Rightarrow v = \frac{qE}{m}\sqrt{\frac{\ell}{g}}$

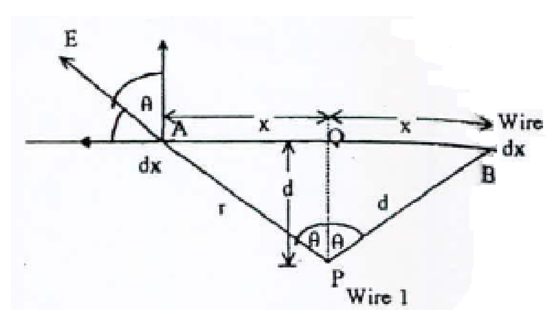
17. 1

Sol. $AP = r = (x^2 + d^2)^{1/2}$

Electric field at A due to wire 1

$$E = \frac{\lambda}{2\pi\varepsilon_0 r}$$

Force on each elemental length dF = E.dq



$$dF = \left(\frac{\lambda}{2\pi\varepsilon_0 r}\right)(\lambda\, dx) = \frac{\lambda^2 dx}{2\pi\varepsilon_0 (x^2+d^2)^{1/2}}$$

Net force on the elemental length

$dF_{net} = 2dF\cos\theta$

$$= \frac{\lambda^2 dX.\cos\theta}{\pi\varepsilon_0 (x^2+d^2)^{1/2}} = \frac{\lambda^2 dx.d}{\pi\varepsilon_0 (d^2+x^2)}$$

Hence total force required to hold the wire

$$2 = \int dF_{net}$$

$$F_{net} = \frac{\lambda^2 d}{\pi\varepsilon_0}\int_{-\infty}^{\infty}\frac{dx}{(d^2+x^2)} = \frac{\lambda^2}{2\varepsilon_0} = \frac{(3\times10^{-6})^2}{2\times8.86\times10^{-12}} = 0.51 \text{ Newton.}$$

As F_{net} is independent of separation between the wire. Hence required work done

$W = 0.51 \times 2 = 1$ Joule.

Chemistry PART – II

SECTION – A

18. C

Sol. $T \propto V^3 \Rightarrow PV^{-2}\,\text{cosnt.} \Rightarrow C = \frac{5R}{2} + \frac{R}{3} = \frac{17R}{6}$

19. B

Sol. $w = -1 \times 3\ L-atm = -300\ J$

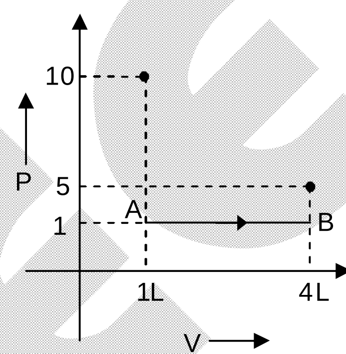
$\frac{10 \times 1}{300} = \frac{5 \times 4}{T} \Rightarrow T = 600K$

$q = 50 \times 300 = 15000\ J$

$\Rightarrow \Delta U = q + w = 14700\ J$

$\Delta H = \Delta U + (PV)$

$= 14700 + (20 - 10) \times 100 = 15700\ J$



20. A

21. D

22. A, B, C

Sol. (A) $-\frac{d[A]}{dt} = \frac{d[B]}{dt} + \frac{d[C]}{dt}$

(B) $K[A] = K_1[A] + K_2[A]$

Where K is overall rate constant.

$K = K_1 + K_2$

or $\frac{dK}{dT} = \frac{dK_1}{dT} + \frac{dK_2}{dT}$

$Ae^{-\frac{Ea}{RT}}\left[\frac{Ea}{RT^2}\right] = A_1e^{-\frac{Ea_1}{RT}}\left[\frac{Ea_1}{RT^2}\right] + A_2e^{-\frac{Ea}{RT}}\left[\frac{Ea_2}{RT^2}\right]$

or $K.Ea = K_1Ea_1 + K_2Ea_2$

or $Ea = \frac{K_1E_{a_1} + K_2E_{a_2}}{K} = \frac{x_1y_1 + x_2y_2}{x_1 + y_2}$

(C) $t_{1/2} = \frac{\ell n2}{K} = \frac{\ell n2}{x_1 + x_2}$

(D) $\ell n\frac{K'}{K} = \frac{E_a}{R}\left[\frac{1}{T_1} - \frac{1}{T_2}\right]$

23. A, C, D

Sol. Addition of an electron to a negatively charged atom requires energy therefore endothermic process

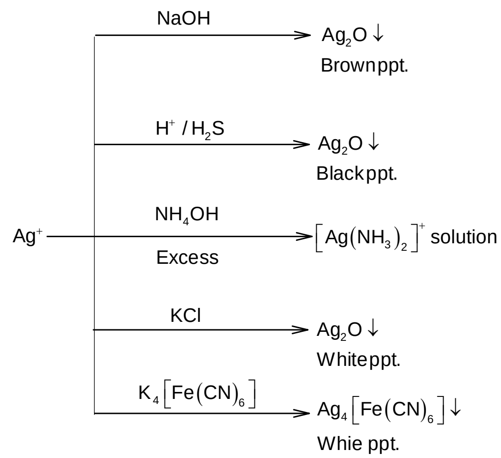
24. A,B,C,D

Sol. All the above structure posses chiral carbon after reduction

25. A

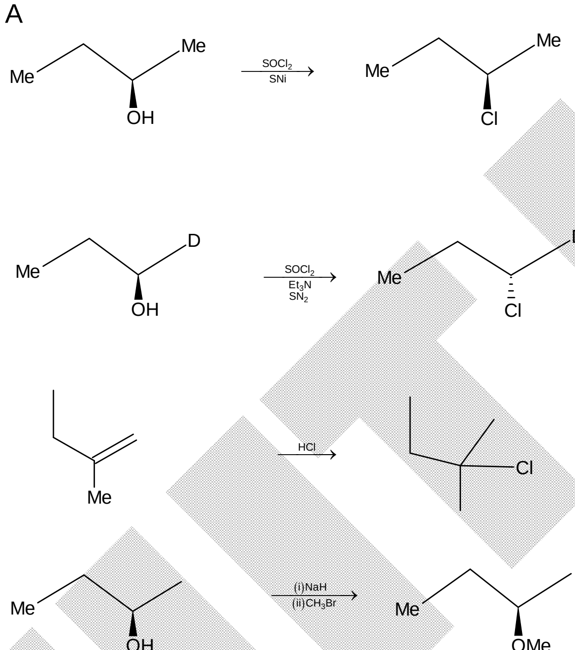
26. B

Sol.



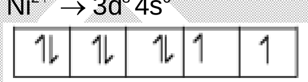
27. A

Sol.



28. C

Sol. $Ni^{2+} \rightarrow 3d^8 4s^0$



$n \rightarrow 2$

$\mu = \sqrt{n(n+2)}$

$Cr^{2+} \rightarrow 3d^4 \rightarrow$ d – d transition because in aq. medium it exists as $[Cr(H_2O)_6]^{2+}$

$V^{2+} \rightarrow d^3 \rightarrow t_{2g}^3 e_g^0$

$Ti^{4+} \rightarrow [Ar]3d^0 4s^0 \rightarrow$ no unpaired electron

SECTION – B

29. 2

Sol. $N_1V_1 = N_2V_2$

$\therefore \dfrac{1.575\times 2}{(90+18x)\times 0.250}\times 16.68=\dfrac{25}{15}$

$\therefore x=2.$

30. 2

Sol. $\underset{a_0-x-y}{A}\xrightarrow{k_1}\underset{2x}{2B};\ \underset{a_0-x-y}{A}\xrightarrow{k_2}\underset{y}{C}$

$a_0-x-y+2x+y=a_0+x=1.25a_0$

% increase in moles $\Rightarrow 25$

So final pressure

$=2\times 1.25=2.5$ atm

31. 5

Sol. $E_n=-\dfrac{13.6}{n^2}\text{eV};\ E_2=-\dfrac{13.6}{2^2};\quad E_4=-\dfrac{13.6}{4^2}\text{eV / atom}$

$\Delta E=E_4-E_2=2.55\text{eV}$

Absorbed energy = work function of metal + K.E.

K.E. = 0.05eV

32. 3

Sol. $Hg(l)\rightleftharpoons Hg(g),$

$\Delta_r S^o=174.4-77.4=97\ J/K-mol$

$\because\quad \Delta G^o=\Delta H^o-T.\Delta S^o=0$

$T=\dfrac{\Delta H^o}{\Delta S^o}$

$=\dfrac{60.8\times 1000}{97}=626.8K$

33. 2

Sol. Atomic mass of N

In given sample

$=\dfrac{3}{4}\times 14+\dfrac{1}{4}\times 15$

$=\dfrac{57}{4}$

Atomic mass of H in given sample

$=\dfrac{4}{5}+\dfrac{1}{6}\times 2=\dfrac{6}{5}$

Molar mass of $NH_3=17.85$

Mole of NH_3 = 0.1×10^{-3}

$=0.0001$

Molecules of NH_3

$=6\times 10^{19}=60\times 10^{18}$

Atoms of N $=60\times 10^{18}$

Atoms of H = 180×10^{18}

Total neutrons

$=\dfrac{3}{4}\times 60\times 10^{19}\times 7+\dfrac{1}{4}\times 60\times 10^{8}\times 8+\dfrac{1}{5}\times 1\times 80\times 10^{18}$

34. 8

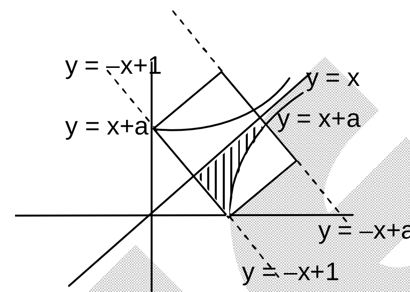
Mathematics

PART – III

SECTION – A

35. D

Sol. Required area of shaded region is $k-\frac{1}{4}$

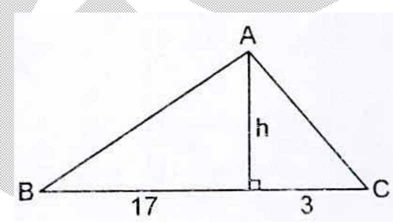


36. B

Sol. B + C = π – A

tan (B + C) = – tan A

$$\frac{h\left(\frac{1}{17}+\frac{1}{3}\right)}{1-\frac{h^2}{51}}=-\frac{22}{7}\Rightarrow\left(\frac{20h}{51-h^2}\right)=-\frac{22}{7}$$



Area of triangle ABC $\Delta=-\frac{1}{2}\times 20\times 11=110$

37. B

Sol. Let three digits of N be :

Hundred's digit = a – d, ten's digit = a, and unit's digit = a + d

(a – d) + a + (a + d) = 15 $\Rightarrow$ a = 5

N = 100(5 – d) + 50 + (5 + d) …(1)

Number obtained by reversing digits of N is

N_1 = 100(5 + d) + 50 + (5 – d) …(2)

Now, 594 = N – N_1 = 10(– 2d) + 2d

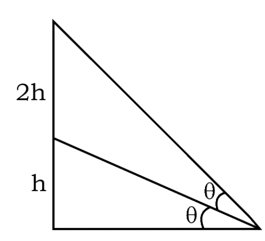
$\Rightarrow$ 2d = – 6 $\Rightarrow$ d = –3

Thus, N = 852 and $\frac{1000}{N-252}=\frac{1000}{600}=\frac{5}{3}$

38. C

Sol. Let $\frac{h}{x}=a$. Then $\tan\theta=a, \tan 2\theta=3a$.

$\therefore\ \frac{2a}{1-a^2}=3a \quad\Rightarrow\quad a=\frac{1}{\sqrt{3}}$



39. A, B, C

Sol. $\vec{r}=\hat{i}-\hat{j}+\lambda\left(2\hat{i}+2\hat{j}-\hat{k}\right); \vec{r}=-2\hat{j}+t\left(5\hat{i}-8\hat{j}-\hat{k}\right)$

$\therefore A\left(2\lambda+1, -2\lambda-1, -\lambda\right); B\left(5t, -8t-2, -t\right)$

So $\overrightarrow{AB}.\left(2\hat{i}-2\hat{j}-\hat{k}\right)=0$ and $\overrightarrow{AB}.\left(5\hat{i}-8\hat{j}-\hat{k}\right)=0$

We get $t = -\frac{1}{3}, \lambda = -1$

Now shortest distance = AB

$\left(\vec{r} - \left(\hat{i} - \hat{j}\right)\right).\vec{n} = 0;\ \vec{n} = \lambda\left(\vec{a} \times \vec{b}\right)$

Where $\vec{a} = 2\hat{i} - 2\hat{j} - \hat{k}$ and $\vec{b} = 5\hat{i} - 8\hat{j} - \hat{k}$

40. B, D

Sol. Total number of ways $= 8 \times {}^{125}C_5 = 62000 = 2^4.5^3.31$

So, the number of factors of N is (1 + 4)(1 + 3)(1 + 1) = 40

41. A, C

42. B

Sol. (P). $OA = 1 + 4\cot\theta$

$OB = 4 + \tan\theta$

OA + OB = 5 + 4 cot θ + tan $\theta \geq 5 +\ 2\sqrt{4\cot\theta\tan\theta}$

$= 5 + (2 \times 2) = 9$

(Q). The reflection of P(4, –1) on y = x is Q (–1, 4).

Hence, PQ = $\sqrt{(4+1)^2 (-1-4)^2} = \sqrt{50} = 5\sqrt{2}$.

(R). AB = $2\sqrt{2}$

OC = $\sqrt{2}$

The maximum value of d is

OF = $\sqrt{2} + 2\sqrt{2} = 3\sqrt{2}$

(S). The given line is $x = 4 + \frac{1}{\sqrt{2}}\left(\frac{y+1}{\sqrt{2}}\right)$ or $y = 2x - 9$

Hence, the intercept made by the x-axis is 9/2.

43. C

Sol. (P). We have $\frac{1}{\log_3 \pi} + \frac{1}{\log_4 \pi} = \log_\pi 3 + \log_\pi 4 = \log_\pi 12$

But $\pi^2 < 12 < \pi^3$, we have $2 < \log_\pi 12 < 3$.

(Q). $3^a = 4;\ a = \log_3 4$

Similarly, b = $\log_4 5$ etc.

Hence, abcdef = $\log_3 4 . \log_4 5 . \log_5 6 . \log_6 7 . \log_7 8 . \log_8 9 = \log_3 9 = 2$

(R). We have to find characteristic of $\log_2 2008$.

We know that $\log_2 1024 = 10$ and $\log_2 2048 = 11$, therefore $10 < \log_2 2008 < 11$

Hence, it has characteristic 10.

(S). $\log_2\left(\log_2\left(\log_3 x\right)\right) = 0 \Rightarrow \log_2\left(\log_3 x\right) = 1 \Rightarrow \log_3 x = 2$

$\Rightarrow x = 9$

Similarly, we have $\log_3\left(\log_2 y\right) = 1$

$\Rightarrow \log_2 y = 3$ or $y = 8$

Therefore, x – y = 1.

44. A

Sol. (P). $I=\lim\limits_{x\to 0}\dfrac{e^{x^2}-1+x-e^x+1}{2\dfrac{\sin^2 x}{x^2}.x^2}=\dfrac{1}{2}\left[\lim\limits_{x\to 0}\dfrac{e^{x^2}-1}{x^2}+\lim\limits_{x\to 0}\dfrac{x-e^x+1}{x^2}\right]=\dfrac{1}{2}\left[1-\lim\limits_{x\to 0}\dfrac{e^x-x-1}{x^2}\right]$

(Q). $I=\lim\limits_{x\to 0}\left(\dfrac{3+x}{3-x}\right)^{1/x}=e^{\lim\limits_{x\to 0}\frac{1}{x}\left(\frac{3+x}{3-x}-1\right)}=e^{\lim\limits_{x\to 0}\frac{2x}{x(3-x)}}=e^{2/3}\Rightarrow 2+3=5$

(R). $\lim\limits_{x\to 0}\dfrac{(\tan^3 x-x^3)-(\tan x^3-x^3)}{x^5}$

$$=\lim_{x\to 0}\frac{\tan^3 x-x^3}{x^5}-\underbrace{\lim_{x\to 0}\frac{\tan^3 x-x^3}{x^5}}_{\text{zero(by expansion)}}$$

$$==\lim_{x\to 0}\frac{(\tan x-x)}{x^3}.\frac{(\tan^2 x+x\tan x+x^2)}{x^2}=\frac{1}{3}\times 3=1$$

(S). Rationalising given

$$\lim_{x\to 0}\frac{(x+2\sin x)\left[\sqrt{(x^2+2\sin x+1)}+\sqrt{\sin^2-x-x+1}\right]}{(x^2+2\sin x+1)-(\sin^2 x-x+1)}$$

$$=2.\lim_{x\to 0}\frac{x+\sin 2x}{x^2-\sin^2 x+2\sin x+x}$$

$$=2.\lim_{x\to 0}\frac{1+\dfrac{\sin 2x}{x}}{x-\dfrac{\sin^2 x}{x}+2+1}=2\left(\frac{1+2}{3}\right)=2$$

45. C

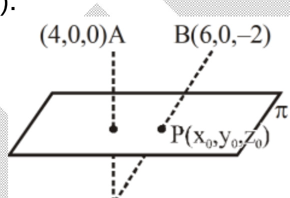
Sol. Let the plane be $\alpha x+\beta z+1=0$

Pass through (1, 0, 1); (3, 2, –1)

$\therefore \alpha=-\dfrac{1}{2};\ \beta=-\dfrac{1}{2}$

(P). $\pi: x+z=2$

(Q).



Both A and B are on same side of π.

Reflection of A in plane is A'(2, 0, –2)

Equation of line A'B = $\vec{r}=6\hat{i}-2\hat{k}+\lambda(4\hat{i})$

For P : $6+4\lambda+0-2=2\Rightarrow \lambda=\dfrac{-1}{2}$

$\therefore$ P(4, 2, – 2)

$\therefore\ |4x_0+y_0+2z_0|=12$

(R). Now $|PA-PB|_{min}=0$

$|PA-PB|_{min}$ will approach

AB = $\sqrt{4+0+4}=\sqrt{8}$

$\therefore |PA-PB|\in[0,\sqrt{8})$.

(S). Also, A' will lie on $\frac{x-2}{1}=\frac{y-\alpha}{0}=\frac{z+\beta}{-1}$.

$\Rightarrow \frac{2-2}{1}=\frac{0-\alpha}{0}=-\frac{2+\beta}{-1}$

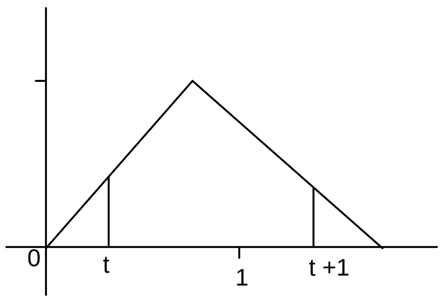
$\Rightarrow \alpha = 0, \beta = 2$

$\therefore \alpha^4+\beta^4=16$

SECTION – B

46. 2

Sol. The region M is the large triangle in the diagram below, and the region N is the infinite strip between the lines $x=t$ and $x=t+1$ where $0<t<1$



Hence $M\cap N$ is the pentagon. Its area is given by

$$\frac{1}{2}\left(\sqrt{2}^2-t^2-\left(2-(t+1)\right)^2\right)=-t^2+t+\frac{1}{2}$$

47. 6

Sol. $t^2+3t-8=2 \quad \Rightarrow t=2,-5$

$2t^2-2t-5=-1 \Rightarrow t=2,-1$

So, at $t=2$

$$\frac{dy}{dx}=\left(\frac{\frac{dy}{dt}}{\frac{dx}{dt}}\right)_{t=2}=\frac{6}{7}$$

48. 4320

Sol. a_3 is coefficient of x^3

$$\frac{10!}{8!}\times 3\times 4+\frac{10!}{7!3!}\times 3^3=4320$$

49. 1

Sol. Applying $C_1 \to C_1-\sin\theta C_3$ and $C_2 \to C_2+\cos\theta C_3$, we get

$$f(\theta)=\begin{vmatrix} 1 & 0 & -\sin\theta \\ 0 & 1 & \cos\theta \\ \sin\theta & -\cos\theta & 0 \end{vmatrix}$$

Applying $R_3 \to R_3-\sin\theta R_1+\cos\theta R_2$, we get

$$f(\theta)=\begin{vmatrix} 1 & 0 & -\sin\theta \\ 0 & 1 & \cos\theta \\ \sin\theta & 0 & \sin^2\theta+\cos^2\theta \end{vmatrix}=1$$

Thus, $f\left(\frac{\pi}{6}\right)=1$

50. 7

Sol. a = n (111111) is divisible $7 \times 11 \times 3$.
Hence for a to be a divisible by 924, n = 4 or 8 and n + m = 11; k = nm
$\therefore$ (n, m) $\equiv$ (4, 7), (8, 3)
$\therefore$ required value $= \frac{4\times 7}{8\times 3}=1.67$

51. 3

Sol.