FIITJEE
ALL INDIA TEST SERIES
JEE (Advanced)-2024
FULL TEST – V
PAPER –2
TEST DATE: 08-02-2024

ANSWERS, HINTS & SOLUTIONS

Physics

PART – I

SECTION – A

1. C

Sol. $m\frac{dv}{dt} = -6\pi\eta rv$

$(1)\frac{dv}{dt} = 6\pi\left(\frac{1}{18\pi}\right)(1)v$

$\frac{dv}{dt} = -\frac{v}{3}$

$\frac{dv}{v} = -\frac{dt}{3}$

$[\ln v]_2^{0.5} = \left[-\frac{t}{3}\right]_{t_1}^{t_2}$

$\ln 4 = \frac{\Delta t}{3}$

$\Delta t = 3\ln 4$

2. B

Sol. $-3kx = ma$; $a = \frac{(-)3k}{m}x$

3. A

Sol. $\ell = R\left(\frac{1+\sqrt{\mu}}{\sqrt{\mu}-1}\right)$; $\mu = \left(\frac{R+\ell}{R-\ell}\right)^2$

4. A

Sol. $a_n = \frac{8\pi^2 Rgh}{H^2 + 4\pi^2R^2}$; $a_t = \frac{gh}{\sqrt{H^2 + 4\pi^2R^2}}$

5. AD

Sol. More is optical density, more will be reflected light.

6. AC

Sol. Conservation of linear momentum

$$V_{cm} = \frac{v}{3}$$

Conserving angular momentum about centre of mass of system

$$mv\frac{\ell}{3} = \left[\frac{2m\ell^2}{12} + 2m\left(\frac{\ell}{6}\right)^2 + m\left(\frac{\ell}{3}\right)^2\right]\omega$$

$$\Rightarrow \quad \omega = \frac{v}{\ell}$$

Initial K.E., $k_1 = \frac{1}{2}mv^2$

Final K.E., $k_2 = \frac{1}{2}(3m)\left(\frac{v}{3}\right)^2 + \frac{1}{2}\left(\frac{m\ell^2}{3}\right)\omega^2 = \frac{mv^2}{3}$

Loss in K.E. = $k_1 - k_2$.

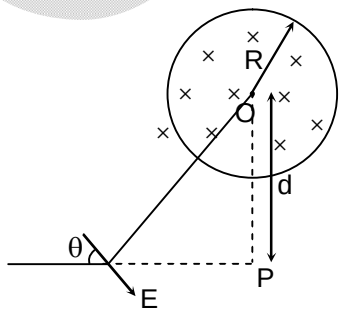
7. ACD

Sol. $\int \vec{E}\cdot d\vec{l} = A\frac{dB}{dt}$

$$E2\pi\sqrt{x^2+d^2} = \pi R^2 k$$

$$E = \frac{\pi R^2 k}{2\sqrt{x^2+d^2}}$$

$$W_{ext} = \int_0^\infty q\vec{E}\cdot dx = \frac{q\pi R^2}{4}k$$



SECTION – B

8. 2

Sol. $T = 2\pi\sqrt{\frac{1}{g}} \quad \Rightarrow T^2 = 4\pi^2 1/g \quad \Rightarrow g = \frac{4\pi^2 l}{T^2}$

Here % error in $l = \frac{1\,mm}{100\,cm}\times 100 = \frac{0.1}{100}\times 100 = 0.1\%$

and % error in $T = \frac{0.1}{2\times 100}\times 100 = 0.05\%$

$\therefore$ % error in g = % error in l + 2 (% error in T) = 0.1 + 2 × 0.05 = 0.2%.

9. 1

Sol. 30 VSD = 29 MSD

1 VSD = $\frac{29}{30}$MSD

L.C. = 1 MSD – 1 VSD

$= \left(1-\frac{29}{30}\right)\text{MSD} = \frac{1}{30}\times 0.5^0 = 1$ minute

10. 5

Sol. At stable equilibrium, U is minimum.

$\frac{dU}{dx} = 0$ and $\frac{d^2U}{dx^2} > 0$

$= \frac{1}{dx}\left(\frac{x^3}{3}-\frac{ax^2}{2}+20x\right) = 0.$

$\Rightarrow \quad x^2 - 9x + 20 = 0. \quad \Rightarrow \quad (x-5)(x-4) = 0.$

$x = 5$ and $x = 4$ are points of equilibrium.

And U minimum when $\frac{d^2U}{dx^2} > 0$. i.e. at $x = 5$.

11. 2

Sol. $\frac{\frac{3}{2}KT+\frac{5}{2}KT}{2} = 2\,KT$

12. 5

Sol. $\Delta Q = \Delta W$ (work done by the gas)

$5 = 10\,(2-1) + 0 + W_{CA}$

$\Rightarrow \; W_{CA} = 5 - 10 = -5$ J.

$\therefore$ Work done on the gas is process $C \to A = -W_{CA} = 5$ J.

13. 3

Sol. $2000 \times 15 \times 0.5 + m \times 80 = 2500 \times 25 \times 1$

$m = 500$ gm

Water = 2.5 kg + 0.5 kg = 3 kg.

SECTION – C

14. 1.47

Sol. $T_B = \frac{P_B}{P_A}T_A = 2T_0$

$(2T_0)V_0^{\frac{13}{9}-1} = T_C \cdot (2V_0)^{\frac{13}{9}-1}$

$\Rightarrow \quad T_C = 2^{5/9}T_0$

15. 0.30

Sol. Heat is absorbed during the process AB and BC

$Q_{AB} = \frac{3}{2}R(T_B - T_A) = \frac{3}{2}RT_0$

$Q_{BC} = \left(\frac{3}{2}R - \frac{9}{4}R\right)(T_C - T_B) = \frac{3}{4}R \times (2-2^{5/9})T_0$

$Q_{abs} = \frac{3}{4}(4-2^{5/9})RT_0 \cong \frac{15}{8}RT_0 [2^{5/9} \cong 1.5]$

$$Q_{rej} = \frac{3}{8}(2 + 2^{5/9})RT_0 \cong \frac{21}{16}RT_0$$

$$Q_{CD} = \frac{3}{2}R(T_D - T_C)$$

$$Q_{DA} = \left(\frac{3}{2}R - \frac{9}{4}R\right)(T_A - T_D)$$

$$W = \frac{9}{16}RT_0 \quad ; \quad \eta = \frac{W}{Q_{abs}} = 30\%$$

16. 3.18

Sol. $i = \frac{\frac{d\phi B}{dt}}{R} = \frac{(\pi \cdot 1^2) \cdot (0 + 2t)}{2} = \pi t$

At the time of toppling

$T_{ng} = \left|\vec{\mu} \times \vec{B}\right|$

$= \pi \times g \times 1 = \left|(\pi \cdot 1^2 \times \Lambda t)(-\hat{j}) \times (i + t^2\hat{j})\right|$

$= \pi g = \left|\pi^2 + \hat{k}\right| = \pi^2 t$

$\therefore \quad t = \frac{g}{\pi} = \frac{10}{\pi}$

17. 0.21

Sol. Required heat $= \int i^2 R dt = \int_{\theta}^{10/\pi} \pi^2 t^2 \times 2 \, dt = \frac{2000}{3\pi} J = \frac{2}{3\pi} kJ$

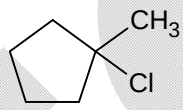
Chemistry

PART – II

SECTION – A

18. C
Sol. Planar '4n' π-electron systems are anti-aromatic.

19. D
Sol. In D, SIR prevent +R effect of 'N', hence benzene ring is not activated.

20. C
Sol. E_a for transformation to carbocation is much favourable in 

21. C
Sol. Resonance dominates over hyperconjugation.

22. ABCD
Sol. All options correctly represent characteristics of interstitial compounds.

23. ABCD
Sol. Above statements define correct lattice structures of diamond.

24. BCD
Sol. On analyzing Schrodinger wave equation, it indicates for 3d orbital.

SECTION – B

25. 4
Sol. Chloroplatinic acid $H_2[PtCl_6]$ is the product.

26. 3
Sol. Apply mechanism of haloform reaction.

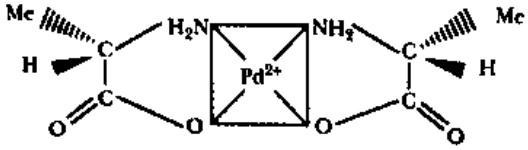
27. 2
Sol. $(CH_2)_6N_4$ is final product.

28. 4
Sol. In Etard reaction benzaldehyde is formed.

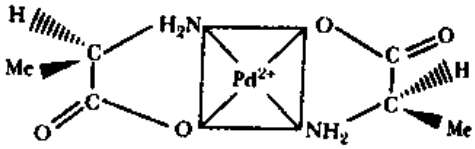
29. 3
Sol.
$$\text{Rate} = K\left[CH_3-\overset{\overset{O}{\|}}{C}-H\right]^2[\text{base}]$$

30. 6

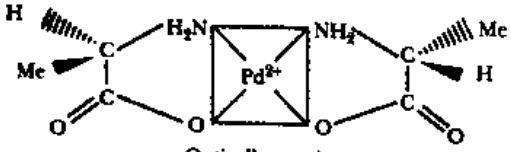
Sol.



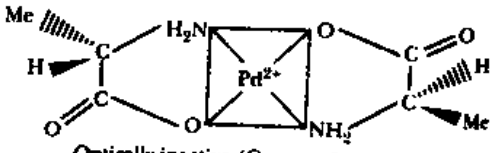
Optically inactive (Plane of symmetry)
(*cis*)



Optically active
(*trans*)



Optically active
(*cis*)



Optically inactive (Centre of symmetry)
(*trans*)

SECTION – C

31. 17.08

Sol. $\left[Fe(CN)_6\right]^{4-} + 30H_2O \longrightarrow Fe^{3+} + 6CO_2 + 6NO_3^- + 60H^+ + 61e^-$

i.e. n-factor of $K_4[Fe(CN)_6]$ = 61

$61 \times N_{KMnO_4} = 5 \times 61$

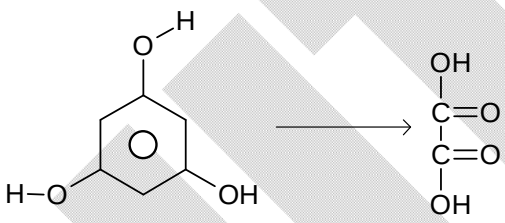
$N_{KMnO_4} = 5$

$100 \times \frac{V.S}{5.6} = 61 \times 5$

$V.S = 17.08$

32. 5.04

Sol.



n = 18

$C_6H_6O_3 \longrightarrow 3H_2C_2O_4 + 18H^+ + 18e^- + 9H_2O$

$40 \times \frac{x}{5.6} = 10 \times 0.2 \times 18$

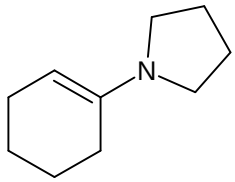
x = 5.04

33. 44.31

Sol. Product is DDT

34. 25.16

Sol.

Product is 

Mathematics

PART – III

SECTION – A

35. D

Sol. $\left|z_1^2 - z_2^2\right| = \left|\left(\overline{z_1}\right)^2 + \left(\overline{z_2}\right)^2 - 2\overline{z_1}\,\overline{z_2}\right|$

$\Rightarrow \left|(z_1 - z_2)(z_1 + z_2)\right| = \left|\left(\overline{z}_1 - \overline{z}_2\right)^2\right|$

$\Rightarrow \left|(z_1 - z_2)(z_1 + z_2)\right| = \left|\left(\overline{z_1 - z_2}\right)^2\right| = \left|z_1 - z_2\right|^2$

$\Rightarrow \left|z_1 + z_2\right| = \left|z_1 - z_2\right| \quad \Rightarrow \left|\arg\dfrac{z_1}{z_2}\right| = \dfrac{\pi}{2}$

$\Rightarrow \arg\dfrac{z_1}{z_2} = \pm\dfrac{\pi}{2}$ for least possible value of $|a+b|$

$\arg\dfrac{z_1}{z_2} = \dfrac{-\pi}{2}$

So $\left|\dfrac{a+b}{2}\right| = \dfrac{1}{2}$

36. B

Sol. $|A| = x + y + z$

$\left|\text{adj}\left(\text{adj}\left(\text{adj}\left(\text{adj}\right)\right)\right)\right| = |A|^{(n-1)^4} = |A|^{16}$

$|A|^{16} = 4^8 . 5^{16} = 2^{16} . 5^{16}$

$|A| = 2 \times 5 = 10 = x + y + z$

$x + y + z = 10$

Number of natural numbers solutions $= {}^{10-1}C_{3-1} = {}^{9}C_2 = 36$

$\Rightarrow p = 36$

$\int_{-\pi/2}^{\pi/2} 2^{\sin x}\,dx + \int_{5/2}^{4} \sin^{-1}\left(\log_2(x-2)\right)dx$

sub $x - 2 = t$

$+\int_{1/2}^{2} \sin^{-1}\left(\log_2 t\right)dt$

$\int_{-\pi/2}^{\pi/2} 2^{\sin x}\,dx + \int_{1/2}^{2} \sin^{-1}\left(\log_2 x\right)dx = \dfrac{\pi}{2}2^{\sin\pi/2} - \left(\dfrac{-\pi}{2}\right)2^{\sin(-\pi/2)}$

$= \dfrac{\pi}{2}.2 + \dfrac{\pi}{2}.\dfrac{1}{2}$

$= \pi + \dfrac{\pi}{4} = \dfrac{5\pi}{4}$

So, $p = 36,\ q = 5$

37. D

Sol. $f(x) = xe^x + (xe^x)^{-1}$

$= x e^x + \frac{1}{x} e^{-x}$

$f'(x) = (x+1)e^x - \frac{1}{x^2} e^{-x} - \frac{1}{x} e^{-x}$

$= (x+1)e^x - \frac{e^{-x}}{x^2}(1+x)$

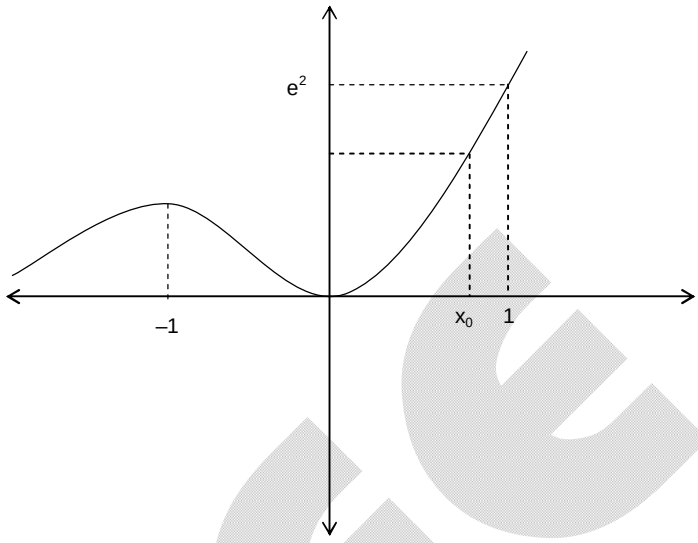
$= \frac{(1+x)}{x^2} e^{-x}\left[x^2 e^{2x} - 1\right]$

$f'(x) = 0 \Rightarrow 1 + x = 0$ or

$x^2 e^{2x} - 1 = 0$

From figure $x^2 e^{2x} - 1 = 0$

at $x = x_0 \in (0, 1)$



So $x = -1$ and x_0 are two points of extrema. At $x = x_0$ $x^2 e^{2x} - 1$ changes sign from –ive to +ive $\Rightarrow x_0$ is point of minima. At $x = -1$ sign of $f(x)$ changes from time to + ive to –ive

$\Rightarrow x = -1$ is point of maxima.

38. C

Sol. $f(x) = x^4 + px^2 + qx + r$ has 3 repeated zeros.

Let repeated root be α

$f(\alpha) = \alpha^4 + p\alpha^2 + q\alpha + r = 0$ .....(1)

$f'(\alpha) = 4\alpha^3 + 2p\alpha + q = 0$ .....(2)

$f''(\alpha) = 12\alpha^2 + 2p = 0 \Rightarrow p = -6\alpha^2$ .....(3)

Sub p in (2)

$4\alpha^3 - 12\alpha^3 + q = 0$

$q = 8\alpha^3$

sub p in (2)

$4\alpha^3 - 12\alpha^3 + q = 0$

$q = 8\alpha^3$

Sub p and q

$\alpha^4 + (-6\alpha^2)\alpha^2 + 8\alpha^3\alpha + r = 0$

$r = -3\alpha^4$ .....(4)

$r = -3\left(-\frac{p}{6}\right)^2 \Rightarrow p^2 = -12r$

$\Rightarrow y^2 = -12x$

length of L.R = 12

39. ABC

Sol. α, β roots of $x^2 - x - 1 = 0$

$\Rightarrow \alpha^{n+2} - \alpha^{n+1} - \alpha^n = 0$ ……..(1)

and $\beta^{n+2} - \beta^{n+1} - \beta^n = 0$ ……..(2)

$\alpha^{n+2} - \beta^{n+2} - \left(\alpha^{n+1} - \beta^{n+2}\right) - \left(\alpha^n - \beta^n\right) = 0$

$\Rightarrow \dfrac{\alpha^{n+2} - \beta^{n+2}}{\sqrt{5}} - \left(\dfrac{\alpha^{n+1} - \beta^{n+1}}{\sqrt{5}}\right) - \left(\dfrac{\alpha^n - \beta^n}{\sqrt{5}}\right) = 0$

$\Rightarrow T(n+2) - T(n-1) - T(n) = 0$

$\Rightarrow T(n+2) = T(n+1) + T(n)$

(A) Put $n = 2021$

(B) $T_1 = \dfrac{\alpha - \beta}{\sqrt{5}} = 1,\ T_2 = \dfrac{\alpha^2 - \beta^2}{\sqrt{5}} = \dfrac{(\alpha - \beta)(\alpha + \beta)}{\sqrt{5}} = 1$

$T_3 = 1 + 1 = 2,\ T_4 = 3, T_5 = 5,\ T_6 = 8,\ T_7 = 13,\ T_8 = 21,\ T_9 = 34,\ T_{10} = 55$

(C) $\sum_{n=1}^{2021} \left(T(n+2) - T(n+1)\right) = \sum_{n=1}^{2021} T(n)$

$T(2023) - T(2) = \sum_{n=1}^{2021} T(n)$

$T(2023) - 1 = \sum_{n=1}^{2021} T(n)$

40. AC

Sol. ΔABC is isosceles right angled at A

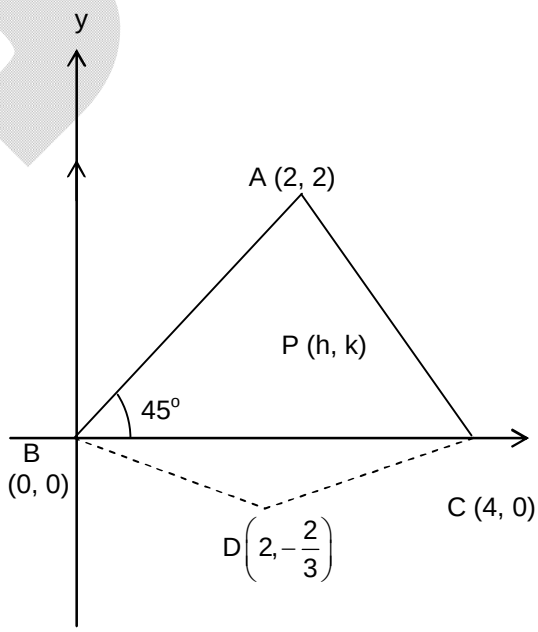
Let P be (h, k)

Let ABC be triangle as shown in figure

Equation BC : y = 0

$AB : y - x = 0$

$AC : x + y - 4 = 0$



Given condition

$k^2 = \dfrac{1}{2} \dfrac{|h + k - 4|}{\sqrt{1+1}} \cdot \dfrac{|k - h|}{\sqrt{1+1}}$

Replace (h, k) by (x, y)

$\Rightarrow y^2 = \left|(x + y - 4)(y - x)\right|$

$= -\dfrac{1}{4}(x + y - 4)(x - y)$

$\Rightarrow 4y^2 = -\left(x^2 - y^2 - 4(x - y)\right)$

$x^2 + 3y^2 - 4x + 4y = 0$

$(x-2)^2 + 3\left(y^2 + \dfrac{4}{3}y + \dfrac{4}{9}\right) = 4 + \dfrac{4}{3}$

$(x-2)^2 + 3\left(y + \dfrac{2}{3}\right)^2 = \dfrac{16}{3}$

$$\frac{(x-2)^2}{\frac{16}{3}}+\frac{\left(y+\frac{2}{3}\right)^2}{\frac{16}{9}}=1$$

$$\frac{16}{9}=\frac{16}{3}\left(1-e^2\right)$$

$$\frac{1}{3}=1-e^2 \Rightarrow e=\sqrt{\frac{2}{3}}$$

$$D=\left(2,\frac{-2}{3}\right)$$

$$\text{Area}=\text{Ar}(ABC)+\text{Ar}\,BCD$$

$$=\frac{1}{2}.4.2\sqrt{2}\times\frac{1}{\sqrt{2}}+\frac{1}{2}\times 4\times\frac{2}{3}$$

$$=4+\frac{4}{3}=\frac{16}{3}$$

41. ABCD

Sol. $-e^{-x^2}\frac{dy}{dx}=2xy^2$

$$\int\frac{dy}{y^2}=\int -2xe^{x^2}dx$$

$$-\frac{1}{y}=-e^{x^2}+c$$

$$\frac{1}{y}=e^{x^2}+c \Rightarrow y=\frac{1}{e^{x^2}+c}=f(x)$$

$$f(0)=\frac{1}{2}=\frac{1}{1+c}\Rightarrow c=1$$

$$\Rightarrow f(x)=\frac{1}{e^{x^2}+1}$$

Since $0<f(x)\le\frac{1}{2}$ $\Rightarrow (D)$

$\Rightarrow (A)$ is correct

(B) Since $0<f(x)\le\frac{1}{2}$

$$\int_0^0 0\,dx<\int_0^1 f(x)dx\le\int_0^1\frac{1}{2}dx$$

$$\int_0^1 f(x)dx<\frac{1}{2}$$

(C) $f(x)=\frac{1}{e^{x^2}+1}$

$$f(x)>\frac{1}{e+1}$$

$\int_0^1 f(x)dx > \int_0^1 \frac{1}{e+1}dx$

$(e+1)\int_0^1 f(x)dx > 1$

SECTION – B

42. 6

Sol. $B = \text{adj}(A)$ ……(i)

$B^T B^{-1} = A$ ……(ii)

We know $A^{-1} = \frac{1}{|A|}\text{adj}\,A \Rightarrow (\text{adj}\,A) = |A|A^{-1}$

$\left|B^T B^{-1}\right| = |A|$

$|B| \times \frac{1}{|B|} = |A| \Rightarrow |A| = 1$

So $(\text{adj } A) = A^{-1}$

Hence $B = A^{-1}$

$\Rightarrow B^{-1} = A$

Sub in (2) $\Rightarrow B^T A = A$

Multiplying By $A^{-1}(\text{post})$

$B^T AA^{-1} = AA^{-1}$

$B^T = I \Rightarrow B = I$

Hence $A = I$

$B + A = 2I$

$\text{tr}(A + B) = 6$

43. 16

Sol. Variance of 2, 5, 8, 11, 14, 17, 20, 26, 29, 32 is σ_1^2 on subtracting 2 from each term variance will remain same

i.e. 0, 3, 6, 9, 12, 15, 18, 24, 27, 30 also has variance σ_1^2

$\Rightarrow \sigma_1^2 = 9\left(\frac{12-1}{12}\right)$

$= 1,5,9,13,17,21,25,29,33,37,41$ has variance σ_2^2

$\Rightarrow 0,4,8,12,16,20,\ 24,28,32,36,40$ has variance σ_2^2 (subtracting 1)

$\sigma_2^2 = 16\left(\frac{10^2-1}{12}\right)$

$\frac{\sigma_2^2}{\sigma_1^2} = \frac{16}{9}$

44. 0

Sol. $a = \cos^{-1}\cos(20 - 6\pi) = 20 - 6\pi$

$b = \cos^{-1}\cos(10\pi - 30) = 10\pi - 30$

$c = \sin^{-1}\sin(20-6\pi+10\pi-30) = \sin^{-1}\sin(4\pi-10)$

$= \sin^{-1}\sin(\pi+3\pi-10)$

$= \sin^{-1}\left[-\sin(3\pi-10)\right]$

$= -(3\pi-10) = 10-3\pi$

$a+b+c = 20-6\pi+10\pi-30+10-3\pi = \pi$

$5\sec^{-1}\alpha + 10\sin^{-1}\beta = 10\pi$

$\Rightarrow 5\sec^{-1}\alpha = 5\pi,\ 10\sin^{-1}\beta = 5\pi$

$\Rightarrow \alpha = -1,\ \beta = 1$

45. 94

Sol. $m = {}^5C_4 . 4! = 5! =$ Total

When exactly 2 elements of A maps to itself i.e. $f(3)=3, f(4)=4$

$\therefore$ From 5, 6, 7 select any 2 in ${}^3C_2 \times 2! = 6$

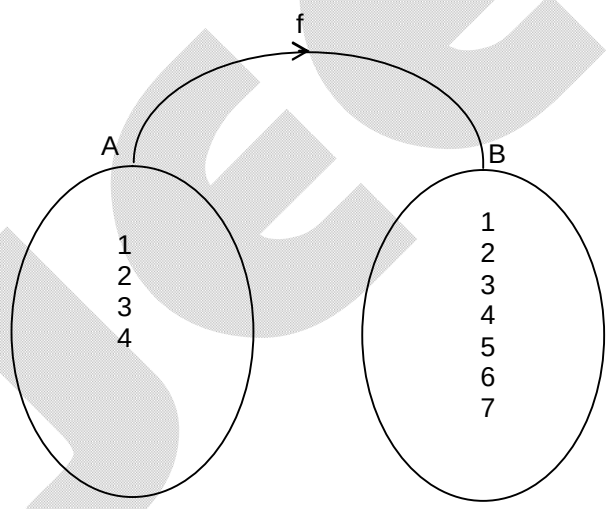
When exactly one element of A maps to itself say $f(3)=3$

Now 4 can be map in 3 ways and remaining elements $3\times 2 = 6$

$\therefore \quad {}^2C_1 \times 3 \times 6 = 36$

Total $= 36+6 = 42 \Rightarrow 5! - 42 = 78 = m$

$n = {}^2C_1 . {}^2C_1 . {}^2C_1 . {}^2C_1 = 16$



46. 12

Sol. $y = \sqrt[3]{x+\sqrt{1+x^2}} + \sqrt[3]{x-\sqrt{1+x^2}}$

$y^3 = \left(\sqrt[3]{x+\sqrt{1+x^2}} + \sqrt[3]{\sqrt{x-\sqrt{1+x^2}}}\right)^3$

$= x+\sqrt{1+x^2} + x-\sqrt{1+x^2} + 3\sqrt[3]{x+\sqrt{1+x^2}}\sqrt[3]{x^2\sqrt{1+x^2}}\left(\sqrt[3]{x-\sqrt{1+x^2}} + \sqrt[3]{x-\sqrt{1+x^2}}\right)$

$y^3 = 2x + 3\sqrt[3]{x^2-(1+x^2)}\,y$

$y^3 = 2x-3y \Rightarrow x = \dfrac{y^3+3y}{2} = f^{-1}(y)$

$f^{-1}(x) = \dfrac{x^3+3x}{2}$

$f^{-1}(n) = \dfrac{n^3+3n}{2}$

$\sum_{n=1}^{n} f^{-1}(n) = \dfrac{1}{2}\left[\left(\dfrac{n(n+1)}{2}\right)^2 + \dfrac{3n(n+1)}{2}\right]$

$$= \frac{n^2(n+1)^2}{8} + \frac{3n(n+1)}{4}$$

So, $\lambda = 8, \mu = 4$

47. 5

Sol. $\bar{V} \times \bar{b} = \bar{C}$

Taking crosses product with $\bar{b}$

$\bar{b} \times (\bar{v} \times \bar{b}) = \bar{b} \times \bar{c}$

$|\bar{b}|^2 \bar{v} - (\bar{b}.\bar{v})\bar{b} = \bar{b} \times \bar{c}$

$4\bar{v} - (\bar{b}.\bar{v})\bar{b} = \bar{b} \times \bar{c}$

$4\bar{v} = (\bar{b}.\bar{v})\bar{b} + \bar{b} \times \bar{v}$

Now $(\bar{v} \times \bar{b}) = \bar{c}$

$|(\bar{v} \times \bar{b})| = |\bar{c}|$

$1 \times 2 \times \sin\theta = \sqrt{3} \Rightarrow \theta = \frac{\pi}{3}$

$\bar{b}.\bar{v} = 2 \times 1 \times \cos\frac{\pi}{3} = 1$

$4\bar{v} = \bar{b} + \bar{b} \times \bar{c}$

$\bar{v} = \frac{1}{4}[\bar{b} + \bar{b} \times \bar{c}]$

So, $k_1 = \frac{1}{4}, k_2 = 1$

$k_1 + k_2 = 1.25$

SECTION – C

48. 648.00

Sol. $f'''(1) = 0$

$f''(2) = 0$

$f'(3) = 0$

$f'(4) = (x-1)^4 (x-2)^3 (x-3)^2 |_{x=4}$

$= 3^4 \times 2^3 \times r$

$= 81 \times 8 = 648$

49. 1.50

Sol. $g(x) = \left|(|x|-1)^4 (|x|-2)^3 (|x|-3)^2 (|x|-4)\right|$

$= (|x|-1)^4 (|x|-3)^2 \left|(|x|-2)^3 (|x|-4)\right|$

$g(x)$ is symmetric about y – axis

$$g(x)=\begin{cases}(-x-1)^4(-x-3)^2\left|(-x-2)^3(-x-4)\right|, x\le 0\\ (x-1)^4(x-3)^4\left|(x-2)^3(x-4)\right|, x\ge 0\end{cases}$$

$$=\begin{cases}(x+1)^4(x+3)^2\left|(x+2)^3(x+4)\right|, & x<0\\ (x-1)^4(x-3)^2(x-2)^3(x-4), & 0\le x<2\\ -(x-1)^4(x-3)^2(x-2)^3(x-4), & 2\le x<4\\ (x-1)^4(x-3)^2(x-2)^3(x-4), & x\ge 4\end{cases}$$

$g'(0+)$ and $g'(0-)$ are non zero opposite in sign

Similarly $g'(4+)$ and $g'(4-)$ are opposite in sign

$\Rightarrow$ not differentiable at 0, 4

By symmetry not differentiable at $x=-4$

So $g(x)$ is not differentiable at 0, ± 4

i.e. 3 values of x

50. 2.00

Sol. $$\frac{a+b+c}{b}=\frac{f(1)}{\frac{f(1)-f(-1)}{2}}=\frac{2f(1)}{f(1)-f(-1)}$$

$$=\frac{2}{1-\frac{f(-1)}{f(1)}}$$

Since $\frac{f(-1)}{f(1)}\ge 0$

So, $\frac{a+b+c}{b}\ge\frac{2}{1-0}=2$

Hence, minimum value of $\frac{a+b+c}{b}$ is 2.

51. 5.29 (Range 5.28 to 5.29)

Sol. Since $H(1)=1, H(2)=2, H(3)=3$

And $H(x)$ is polynomial of 4^{th} degree and ad = 1

$\Rightarrow$ coefficient of $x^4=1$

Hence Let $h(x)=(x-1)(x-2)(x-3)(x-\alpha)+x$

Now $$\frac{H(-1)+H(5)}{H(0)+H(4)}=\frac{-2(-3)(-4)(-1-\alpha)-1+(4.3.2)(5-\alpha)+5}{(-1)(-2)(-3)(-\alpha)+0+3.2.1(4-\alpha)+4}$$

$$=\frac{24+24\alpha+120-24\alpha+4}{6\alpha+24-6\alpha+4}=\frac{37}{7}$$