ALLEN CAREER INSTITUTE KOTA (RAJASTHAN) Path to Success

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CLASSROOM CONTACT PROGRAMME
(ACADEMIC SESSION 2014-2015)

TARGET : JEE (Main + Advanced) 2015

ENTHUSIAST COURSE : SCORE-II

ALLEN JEE (Advanced) TEST

DATE : 03 - 02 - 2015

ANSWER KEY

PART-1 : PHYSICS

Section											
SECTION-I	Q.	1	2	3	4	5	6	7	8	9	10
	A.	A,C,D	A	A,C	A,C	A,B,C,D	A,C,D	A,D	A,B,C,D	B,C,D	A,B,C,D
	Q.	11	12	13	14						
	A.	B	B	C	A						
SECTION-IV	Q.	1	2	3	4	5	6				
	A.	4	8	4	3	8	2				

PART-2 : CHEMISTRY

Section											
SECTION-I	Q.	1	2	3	4	5	6	7	8	9	10
	A.	A,B	B,C,D	B,C,D	A,D	B,C,D	A,C	A,D	B,C	A,B,C,D	A
	Q.	11	12	13	14						
	A.	B	C	D	C						
SECTION-IV	Q.	1	2	3	4	5	6				
	A.	1	8	4	5	8	3				

PART-3 : MATHEMATICS

Section											
SECTION-I	Q.	1	2	3	4	5	6	7	8	9	10
	A.	A,B	C,D	A,B,C,D	B,D	B,D	A,B,C	A,C,D	C,D	B,C	C,D
	Q.	11	12	13	14						
	A.	D	A	D	A						
SECTION-IV	Q.	1	2	3	4	5	6				
	A.	7	1	3	6	4	9				

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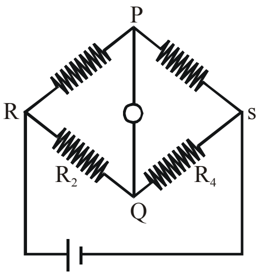
PART-1 : PHYSICS — SOLUTION

SECTION-I

1. Ans. (A, C, D)

Sol.



equivalent diagram is as shown

is P is moved 2cm right them $R_1 = 12$, $R_3 = 3$

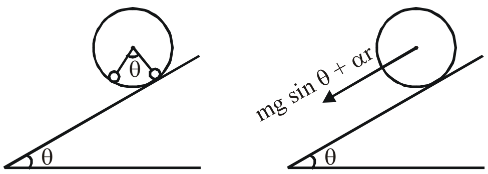
$\frac{R_1}{R_3} = \frac{R_2}{R_4}$ (Hence wheat stone will be balanced)

If s is moved left $\frac{5}{3}$cm then $R_3 = \frac{10}{3}$ and $R_4 = \frac{20}{3}$ hence $\frac{R_1}{R_3} = \frac{R_2}{R_4}$ (hence wheatstone will be balanced)

2. Ans. (A)

Sol. Acceleration slowly increases from zero to α, so small sphere will be at rest w.r.t. ground when maximum acceleration α is to be reached in frame of cylinder, small sphere will have αr downward acceleration

Applying condition of rolling



$$\alpha r = \frac{g\sin\theta + \alpha r}{1 + \frac{2}{5}}$$

$$\frac{7}{5}\alpha r - \alpha r = g\sin\theta$$

$$\theta = \sin^{-1}\left(\frac{2\alpha r}{5g}\right)$$

3. Ans. (A, C)

Sol. R is independent of freq.

(A) is true.

Current becomes maximum at resonance

(B) cannot be true

$X_L = L = 2\pi fL$

(C) is true

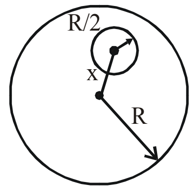
$$Y = \frac{1}{C} = \frac{1}{2\pi fC}$$

(D) can not be true.

4. Ans. (A, C)

Sol. Asteroid-I — Asteroid-II

Field $E = \frac{GM}{R^3}x$ — Field $E_{II} = \frac{GM}{R^3}\left(\frac{R}{2}\right)$



$$\frac{F_I}{F_{II}} = \frac{2x}{R}$$

$$T_I = \frac{2\pi}{4}\sqrt{\frac{R^3}{GM}}$$

$$R = \frac{1}{2}\frac{GM}{R^3}\left(\frac{R}{2}\right)T_{II}^2$$

$$T_{II} = 2\sqrt{\frac{R^3}{GM}}$$

5. Ans. (A, B, C, D)

Sol. $\vec{E} = (10 - 5x)i$

m = 5kg

$\vec{F} = q\vec{E}$

$\vec{F} = (10 - 5x)i$

(a) $F \propto -x$

so motion of charge particle is oscillatory

(b) F = 0 at x = 2

oscillation about x = 2

so maximum displacement is 4

F = 10 – 5x

$$a = \frac{10 - 5x}{2}$$

$a = 2 - x$

$a = -(x - 2)$

so $w^2 = 1$

$w = 1$

(c) $v_{max} = Aw$

$A = 2$

$w = 1$

$v_{max} = 2$

(d) velocity at mean position

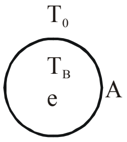
at $x = 2$

6. Ans. (A, C, D)

7. Ans. (A, D)

8. Ans. (A, B, C, D)

Sol.



emissivity of body e

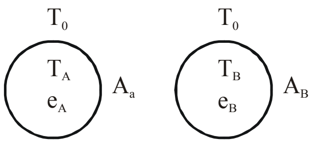
Area of body A

Temperature of body T_B

Temperature of environment T_0

Heat energy radiated by body = $e\sigma A T_B^4$

absorbed by body = $e\sigma A T_0^4$



$e_A \neq e_B$

Then heat emitted by heat emitted by a body is not equal to B.

9. Ans. (B, C, D)

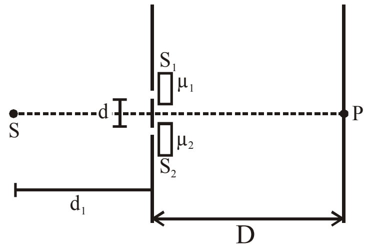
Sol. *the probalility of decay in 1 sec is the decay constant λ, which remains constant

*after average life 37% of nuclei remain undecayed

*Part of energy of disintegration is taken by the recoiling doughter nucleus.

10. Ans. (A,B,C,D)

Sol.



$d_1, D >> d$

Optical path difference due to

S_1 is $= t(\mu_1 - 1) = 9\lambda\left(\frac{4}{3} - 1\right)$

$= 3\lambda$

Optical path differ due to S_2 is

$= t(\mu_2 - 1) = 2\lambda\left(\frac{3}{2} - 1\right) = \lambda$

Path diff. at point P = $3\lambda - \lambda = 2\lambda$

Phase diff. = $\frac{2\pi}{\lambda} \times 2\lambda = 4\pi$

So net intensity at point P is

$I_{net} = I_0 + I_0 + 2I_0 \cos 4\pi$

$I_{net} = 4I_0$

Optical path is conserved by S_1 is more so fringe will shift at upper side.

11. Ans. (B)

Sol. $\frac{1}{2}I_x\omega^2 + \frac{1}{2}I_y\omega^2 = \frac{f}{2}kT \quad \{f_{rotational} = 2\}$

$I_X = I_Y \Rightarrow \mu r^2 = \frac{m}{2}a^2 \qquad \left\{\mu = \frac{m_1 m_2}{m_1 + m_2}\right\}$

$\frac{ma^2}{2}\omega^2 = \frac{2}{2}kT \qquad \mu = \frac{m}{2}$

$\omega = \sqrt{\frac{2kT}{ma^2}}$

12. Ans. (B)

13. Ans. (C)

Sol. A = 27   P = 12

z = 12   n = 15

n > p

By graph 'β' decay is possible

14. Ans. (A)

Sol. ${}^{178}_{88}x \to P = 88$

$n = 178 - 88 = 90$

$n > p$ & $z > 83$ α decay will take place

SECTION-IV

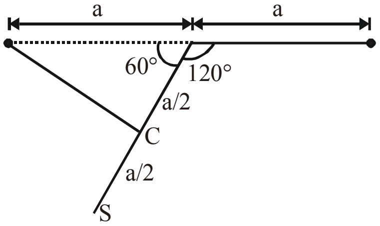
1. Ans. 4

Sol. After moving the loop about side PQ through 120°, the normal on the side PS from the wire will be passing through midpoint C and the net magnetic flux through the loop in the new position will be zero.

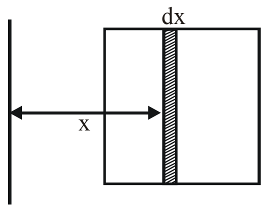
$\therefore$ Change is flux Δf = Flux through the loop in the initial position.

Flux through area element dA

$$d\phi = \vec{B}.d\vec{A}\,\frac{\mu_0 I}{2\pi x}a.dx$$



$$\phi = \int_a^{2a}\frac{\mu_0 Iadx}{2\pi x} = \frac{\mu_0 Ia}{2\pi}\ell n(2)$$



$\therefore$ Charge flown through the square

$$\text{loop} = \frac{\Delta\phi}{R} = \frac{\mu_0 Ia}{2\pi R}\ell n(2)$$

2. Ans. 8

Sol. Height of water column = $\frac{20}{5}$ = 4 cm

mass of water = 20 gm

By work energy theorem

$W_{ext} = \Delta U_{piston} + \Delta U_{water} + KE_{water} = 8 \times 10^{-2}$ Joule

3. Ans. 4

Sol. $W_g + W_{mg} + W_{friction} = \Delta KE$

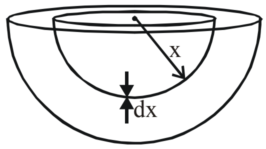
$$W_{friction} = 0 - \frac{1}{2}m\left[\frac{qBR}{m}\right]^2$$

$$W_{friction} = -\frac{1}{2}\frac{q^2B^2R^2}{m} = \frac{-Kq^2B^2R^2}{8m}$$

K = 4

4. Ans. 3

Sol.



$$V = \int_a^b \frac{K\left(2\pi x^2 dx\right)\rho}{x}$$

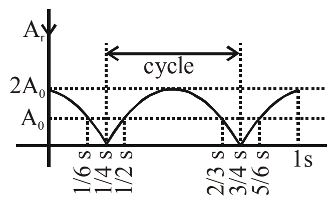
$$V = 2\pi k\rho\left[\frac{b^2 - a^2}{2}\right] = \pi\rho k\,(b^2 - a^2)$$

b = 2a

$v = 3\pi k\rho b^2$

5. Ans. 8

Sol. $y_1 = A \sin \omega_1 t$



$y_2 = A \sin \omega_2 t$

$$y_1 = 2A\cos\left\{\frac{(\omega_2 - \omega_1)}{2}t\right\}\left\{\sin\frac{(\omega_2 + \omega_1)}{2}t\right\}$$

Resultant amplitude $A_r = 2A_0|\cos(\Delta\omega)t/2|$

$$(\Delta\omega)\frac{t}{2} = \frac{\pi}{2} \Rightarrow t = \frac{1}{4}s$$

$$(\Delta\omega)\frac{t}{2} = \frac{\pi}{3} \Rightarrow t = \frac{1}{6}s$$

In one cycle of intensity of 1/2s, the detector remain idle for

$2\left(\frac{1}{4}-\frac{1}{6}\right)s = \frac{1}{6}\sec$

$\therefore$ In ½ sec cycle, active time is $\left(\frac{1}{2}-\frac{1}{6}\right)$

= 1/3 sec

$\therefore$ In 12 sec interval, active time is

$12 \times \frac{(1/3)}{(1/2)} = 8\sec$

6. Ans. 2

Sol. Applying conservation of energy

$mgs(\sin\alpha - \sin\beta) = \frac{1}{2}I\omega^2 + 2\left(\frac{1}{2}mv^2 + \frac{1}{2}I\omega^2\right)$

where $\omega = v/r$ & $I = mr^2/2$

Putting values & solving

$mgs(\sin\alpha - \sin\beta) = \frac{7}{4}mv^2$

$\therefore \quad v = 2\sqrt{\frac{1}{7}gs(\sin\alpha - \sin\beta)}$

$= 2\sqrt{\frac{10\times 3.5}{7}\left(\frac{4}{5}-\frac{3}{5}\right)} = 2$m/s.

PART–2 : CHEMISTRY SOLUTION

SECTION-I

1. Ans. (A,B)

2. Ans. (B,C,D)

3. Ans. (B,C,D)

4. Ans. (A, D)

${}_{92}U^{235} \longrightarrow {}_{82}Pb^{207} + 7\ {}_{2}He^{4} + 4\ {}_{-1}\beta^{0}$

5. Ans. (B, C, D)

6. Ans. (A, C)

7. Ans. (A,D)

8. Ans. (B, C)

9. Ans. (A, B, C, D)

10. Ans. (A)

11. Ans. (B)

$P = K_H \cdot \frac{M}{1000} \times M_{solvent}$

$1.8 = 10^4 \times \frac{M}{1000} \times 18$

$M = 10^{-2}$ mol/L

= 0.044 % (w/v)

12. Ans. (C)

$[H^+] = \sqrt{Ka_1C} = 10^{-4}$

pH = 4

13. Ans. (D)

14. Ans. (C)

SECTION-IV

1. Ans. 1

Cathode : $Fe^{3+} + 1e^- \longrightarrow Fe^{+2}$

Anode : $2H_2O + 2e^- \longrightarrow O_2 + 4H^+ + 4e^-$

milliequivalent of Fe^{2+} = $KMnO_4$ in acidic medium

$= 0.01 \times 30 \times 5$

millimoles of Fe^{2+} formed = 1.5

moles of $Fe^{+2} \times 1 = \frac{I\times t}{96000} = \frac{40\times 10^{-3}\times t}{96000}$

t = 3600 sec. = 1 hr.

2. Ans. 8

3. Ans. 4

4. Ans. 5

5. Ans. 8

6. Ans. 3

PART-3 : MATHEMATICS SOLUTION

SECTION-I

1. Ans. (A,B)

$$\cos(\cos x - \sin x) = \cos\left(\frac{\pi}{2} - (\sin x + \cos x)\right)$$

$$\Rightarrow \cos x - \sin x = 2n\pi \pm \left(\frac{\pi}{2} - (\sin x + \cos x)\right)$$

(+) | (–)

$\Rightarrow \cos x = n\pi + \frac{\pi}{4}$ | $\sin x = -n\pi + \frac{\pi}{4}$

Clearly, n = 0 | clearly n = 0

$\Rightarrow \cos x = \frac{\pi}{4}$ | $\Rightarrow \sin x = \frac{\pi}{4}$

$$\Rightarrow \sin x = \pm\frac{\sqrt{16-\pi^2}}{4}$$

2. Ans. (C,D)

$\because \; z^2 - z = |z|^2 - \frac{64}{|z|^5}$ = a purely real number

$$\Rightarrow z^2 - z = \bar{z}^2 - \bar{z} \Rightarrow (z^2 - \bar{z}^2) - (z - \bar{z}) = 0$$

if $z - \bar{z} = 0 \Rightarrow z = \bar{z}$

$\Rightarrow$ z is purely real number

So put z = x in given equation.

$$x^2 - x - |x|^2 + \frac{64}{|x|^5} = 0$$

$$\Rightarrow x^2 - x - |x|^2 + \frac{64}{x^5} = 0 \text{ (if } x > 0)$$

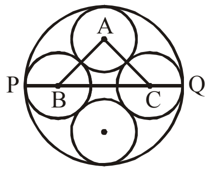
($\because$ x < 0 not possible)

$\Rightarrow x^6 = 64 \Rightarrow x = 2 \quad \therefore |z| = 2$

3. Ans. (A,B,C,D)

Check each option.

4. Ans. (B,D)



Clearly ABC is a right angled triangle with right angle at A and AB = 2r = AC,

PB = QC = r

$\therefore BC^2 = 4r^2 + 4r^2 \Rightarrow BC = 2\sqrt{2}r$

$\therefore PQ = 2\sqrt{2}r + 2r = 2r(1+\sqrt{2})$

$\Rightarrow 2R = 2r(1+\sqrt{2}) \Rightarrow \frac{R}{r} = 1 + \sqrt{2}$

5. Ans. (B,D)

Without loss of generality, we take equation of circle is $x^2 + y^2 = 1$ and fixed point is (a, 0) where $a \geq 0$. Let P(x, y) is a point which is equidistant to both, then

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

$$\Rightarrow 2\sqrt{x^2+y^2} = 2ax + (1-a^2) \quad ......(i)$$

$\downarrow$ squaring

$4(1-a^2)x^2 - 4a(1-a^2)x + 4y^2 = (1-a^2)^2$

if a < 1, then locus is an ellipse and if a > 1, then locus is hyperbola but we get only one branch of hyperbola because if a < 1,

then equation (i) $\Rightarrow$ x is (+)ve.

6. Ans. (A,B,C)

$$\because \; f(n+1) = \frac{f(n)-1}{f(n)+1} = \frac{\frac{f(n-1)-1}{f(n-1)+1} - 1}{\frac{f(n-1)-1}{f(n-1)+1} + 1}$$

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

$$\therefore \; f(n+1) = -\frac{1}{f(n-1)} \quad .....(i)$$

In a similar way $f(n-1) = -\frac{1}{f(n-3)}$ .....(ii)

from (i) and (ii)

$$f(n+1) = -\frac{1}{\frac{-1}{f(n-3)}} = f(n-3)$$

or $f(n+4) = f(n) \;\forall\; n \in N$

hence $f(n)$ is a periodic sequence with period 4

using (A) put n = 1, 2, 3

we get $f(2) = \frac{1}{3}$, $f(3) = -\frac{1}{2}$, $f(4) = -3$

Now $f(2012) = f(4) = -3$

$f(2013) = f(1) = 2$

$f(2015) = f(3) = -\frac{1}{2}$

$f(1001) = f(1) = 2$

7. Ans. (A,C,D)

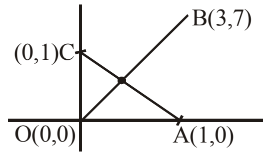
Let O(0, 0), A = (1, 0), B = (3, 4), C = (0, 1)

Now for $f(x, y)$ to be minimum, (x, y) must be the point of intesection of OB and AC

$\therefore \quad f(x, y)_{min} = OB + AC = 5+\sqrt{2}$

which occurs at

$x = \frac{3}{7},\ y = \frac{4}{7}$.



8. Ans. (C,D)

(A) False statement because A^{-1} exist only if det. $A \neq 0$

(B) False statement, as $\det(AB^{-1})$

$= \det(A).\det(B^{-1}) = \frac{|A|}{|B|} = -\frac{6}{2} = -3$.

(C) True Statement, $\because A^2 = \begin{bmatrix} 3 & 3 & 3 \\ 3 & 3 & 3 \\ 3 & 3 & 3 \end{bmatrix} = 3A$

$\Rightarrow \quad A^3 = 3A^2 = 3(3A) \quad \Rightarrow \quad A^3 = 9A$

(D) Given $A^2 = A$ and $B = I - A$.

Now $AB + BA + I - (I - A)^2$

$= AB + BA + I - (I + A^2 - 2A) = AB + BA + A$

$\therefore$ True statement

9. Ans. (B,C)

Disjoint $\Rightarrow$ mutually exclusive.

(A) Two mutually exclusive events E & Fwith P(E) and P(F) > 0 cannot be independent

(B) $P(E) + P(\bar{E}F) + P(\overline{E \cup F})$

$= P(E) + P(F) - P(E \cap F) + P(\bar{E} \cap \bar{F}) = 1$

$\Rightarrow$ exhaustive

(C) $\because \quad P(E/F) > P(E)$

$\Rightarrow \quad \frac{P(E \cap F)}{P(F)} > P(E)$

$\Rightarrow \quad \frac{P(E \cap F)}{P(E)} > P(F)$ or $P(F/E) > P(F)$

(D) Every element of set of positive integer can be of the form 6n, 6n + 1, 6n + 2.....6n + 5. But favourable are 6n + 1, 6n + 5.

So, required probability $= \frac{2}{6} = \frac{1}{3}$.

10. Ans. (C,D)

$\because AA^T = I \Rightarrow \vec{a}, \vec{b}, \vec{c}$ are orthogonal unit vectors

$$\therefore \quad \vec{C} = \pm(\vec{a} \times \vec{b}) = \pm\frac{1}{49}\begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 2 & 3 & 6 \\ 6 & 2 & -3 \end{vmatrix} \Rightarrow c = \pm\frac{(-3\hat{i} + 6\hat{j} - 2\hat{k})}{7}$$

$\because \quad |\vec{a} \times \vec{b}| = 1$

11 Ans. (D)

Given $\int_0^x f(t)dt + \int_0^x (x-t).f(t)dt = e^{-x} - 1$

or, $\int_0^x f(t)dt + x\int_0^x f(t)dt - \int_0^x tf(t)dt = e^{-x} - 1$

Diff. both sides with respect to x, we get.

$f(x) + x.f(x) + \int_0^x f(t)dt - xf(x) = -e^{-x}$

$\Rightarrow f(x) + \int_0^x f(t)dt = -e^{-x} \quad ...(1)$

again diff. w.r.to x $\Rightarrow e^x(f'(x) + f(x)) = 1$ ...(2)

$e^x.f(x) = x + c$, from (1), $f(0) = -1$.

$\therefore f(x) = (x-1)e^{-x}$

$\therefore \int_0^1 f(x)dx = \int_0^1 (x-1)e^{-x}dx = \left(-(x-1)e^{-x}\right)_0^1 + \int_0^1 e^{-x}dx$

$= -1 - \left(e^{-x}\right)_0^1 = -1 - \left(\frac{1}{e} - 1\right) = -\frac{1}{e}$

12. Ans. (A)

Put x = 0 in (2)

$f'(0) + f(0) = 1 \Rightarrow f'(0) = 2$

Paragraph for Question 13 & 14

$g''(x) = Ax$

$\Rightarrow g'(x) = \frac{Ax^2}{2} + B \quad \because \quad g'\left(-\frac{1}{2\sqrt{2}}\right) = 0$

$\Rightarrow \frac{A}{16} + B = 0 \Rightarrow B = -\frac{A}{16}$

$\Rightarrow g'(x) = \frac{Ax^2}{2} - \frac{A}{16}$

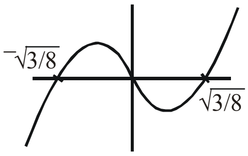
$\Rightarrow g(x) = \frac{Ax^3}{6} - \frac{Ax}{16} + C$

$\because g(0) = 0$ and $g(1) = 5 \Rightarrow c = 0, A = 48$

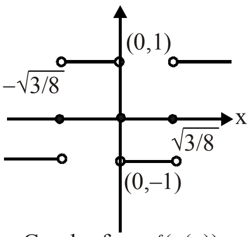
$g(x) = 8x^3 - 3x$

so, $f(g(x)) = \text{sgn}(8x^3 - 3x)$

$$= \begin{cases} -1 & \text{if} \quad x \in \left(-\infty, -\sqrt{\frac{3}{8}}\right) \\ 1 & \text{if} \quad x \in \left(-\frac{\sqrt{3}}{8}, 0\right) \\ -1 & \text{if} \quad x \in \left(0, \sqrt{\frac{3}{8}}\right) \\ 1 & \text{if} \quad x \in \left(\sqrt{\frac{3}{8}}, \infty\right) \end{cases}$$



Graph of y = g(x)



Graph of y = f(g(x))

clearly $f(g(x))$ is not a periodic function

area enclosed between ordinates $x = -\alpha$ to $x = \alpha$

is $= 2\int_0^{\alpha} dx = 2\alpha$

13. Ans. (D)

14. Ans. (A)

$$\frac{dy}{dx} + g'(x).y = (g(x)+1).g'(x)$$

$\therefore$ Integrating factor $= e^{g(x)}$

$\therefore$ solution is

$$y.e^{g(x)} = \int e^{g(x)}.(g(x)+1).g'(x)dx$$

Put $g(x) = t \Rightarrow g'(x)dx = dt$

$$\Rightarrow y.e^{g(x)} = \int e^t(t+1)dt = te^t + c$$

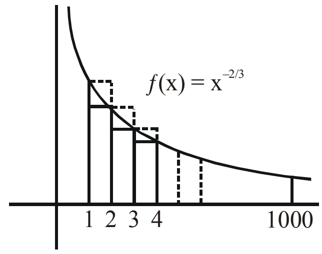
$\Rightarrow h(0) = 1 \Rightarrow 1 = 0 + c \Rightarrow c = 1$

$\therefore h(x) = g(x) + e^{-g(x)}$.

Hence $h(1) = 5 + e^{-5}$

SECTION – IV

1. Ans. 7



$$\because \sum_{n=1}^{1000} n^{-2/3} > \int_1^{1000} x^{-2/3}dx = 3\left(x^{1/3}\right)_1^{1000} = 27 \quad ...(1)$$

and $\displaystyle\sum_{n=1}^{1000} n^{-2/3} < \int_1^{1000} x^{-2/3}dx$

$\{(1^{-2/3} - 2^{-2/3}) + (2^{-2/3} - 3^{-2/3}) + (3^{-2/3} - 4^{-2/3}) + ... + (999^{-2/3} - 1000^{-2/3})\}$

$$= 27 + \underbrace{\{1^{-2/3} - 1000^{-2/3}\}}_{\text{No. is less than 1}} \quad ...(2)$$

$\therefore$ From (1) and (2) $\left[\displaystyle\sum_{n=1}^{1000} n^{-2/3}\right] = 27$

$\Rightarrow m - 20 = 7$

2. Ans. 1

$\because \quad y = x^4 - 6x^3 + 12x^2 + cx + 1$

$$\Rightarrow \frac{dy}{dx} = 4x^3 - 18x^2 + 24x + c = g(x)$$

and $\dfrac{d^2y}{dx^2} = 12x^2 - 36x + 24 = 12(x-1)(x-2)$

Necessary condition, $g(1).g(2) < 0$

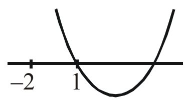
$(8 + c).(10 + c) < 0 \Rightarrow -10 < c < -8$

$\therefore$ Number of integers = 1.

3. Ans. 3

Let $f(x) = x^2 - 2ax + a^2 - 4$

$\because A \cap B = \{x : -2 < x \le 1\}$



$\therefore$ vertex ≥ 1 ...(1)

$f(1) \ge 0$ ....(2) } ∩

$(1) \Rightarrow a \ge 1$

$(2) \Rightarrow a^2 - 2a - 3 \ge 0$

$\Rightarrow (a - 3)(a + 1) \ge 0 \Rightarrow a \le -1$ and $a \ge 3$.

so smallest positive integral value of a is 3.

4. Ans. 6

$$L_1 : \frac{x-0}{1} = \frac{y+1}{1} = \frac{z-0}{1} = \lambda\ ;$$

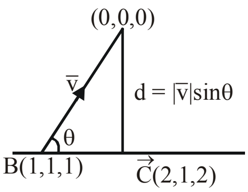
$$L_2 : \frac{x+1}{2} = \frac{y-0}{1} = \frac{z-0}{1} = \mu$$

Hence any point on L_1 and L_2 can be $(\lambda, \lambda-1, 1)$ and $(2\mu-1, \mu, \mu)$

$$\therefore\ \frac{2\mu-1-\lambda}{2} = \frac{\mu-\lambda+1}{1} = \frac{\mu-\lambda}{2}$$

on solving $\mu = 1$, $\lambda = 3$.

$\therefore$ A = (3,2,3) & B = (1,1,1).



Hence equation of AB is $\frac{x-1}{2} = \frac{y-1}{1} = \frac{z-1}{2}$

$$d = \frac{|\vec{v} \times \vec{c}|}{|\vec{c}|} = \frac{\sqrt{2}}{3} \Rightarrow 27d^2 = 27.\frac{2}{9} = 6$$

5. Ans. 4

$\sin^3\theta + \cos^3\theta + 1 = 3\sin\theta\cos\theta$

$\Rightarrow \sin\theta + \cos\theta + 1 = 0$ or $\sin\theta = \cos\theta = 1$

$\Rightarrow \sin\theta + \cos\theta + 1 = 0$

$$\Rightarrow\ \theta = \pi, \frac{3\pi}{2}, 3\pi, \frac{7\pi}{2} \text{ in } \theta \in (0, 4\pi)$$

6. Ans. 9

Req. Probability

$$= \frac{{}^3C_1 . {}^3C_2}{{}^7C_4} = \frac{3\times3}{7\times6\times5} \times 1\times2\times3 = \frac{9}{35} = p$$

$\Rightarrow 35P = 9$