ALLEN CAREER INSTITUTE KOTA (RAJASTHAN)

CLASSROOM CONTACT PROGRAMME
(Academic Session : 2024 - 2025)

JEE (Main)
PART TEST
08-12-2024

JEE(Main + Advanced) : ENTHUSIAST COURSE (SCORE-I)

ANSWER KEY PAPER-1 (OPTIONAL)

PART-1 : PHYSICS

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

PART-2 : CHEMISTRY

SECTION-I	Q.	1	2	3	4	5	6	7	8	9	10
	A.	B	B	D	A	D	B	A	C	B	C
	Q.	11	12	13	14	15	16	17	18	19	20
	A.	D	C	D	D	D	B	D	B	D	C
SECTION-II	Q.	1	2	3	4	5					
	A.	9480	1263	3	10	4					

PART-3 : MATHEMATICS

SECTION-I	Q.	1	2	3	4	5	6	7	8	9	10
	A.	C	D	D	A	B	C	A	A	D	C
	Q.	11	12	13	14	15	16	17	18	19	20
	A.	C	B	B	C	B	A	D	C	C	B
SECTION-II	Q.	1	2	3	4	5					
	A.	0	16	2	50	8					

HINT – SHEET

PART-1 : PHYSICS

SECTION-I

1. Ans (B)

$W_{net} = w_g + w_{spring}$

$= mg(h + d) + \frac{1}{2}k\left(0^2 - d^2\right)$

$w_{net} = mg(h + d) - \frac{1}{2}kd^2$

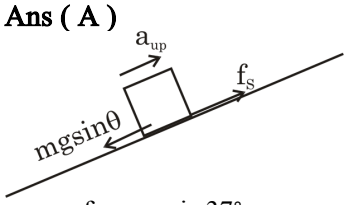
2. Ans (C)

$\frac{1}{2}mv_0^2 + 0 = 4 + 0$

$\frac{1}{2}(0.5)\,v_0^2 = 4$

$v_0 = 4$ m/s

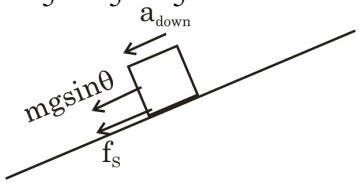
5. Ans (A)



$a_{up} = \frac{f_s - mg\sin 37°}{m}$

$(a_{up})_{max} = \frac{\mu mg\cos 37° - mg\sin 37°}{m}$

$= \frac{4g}{5} - \frac{3g}{5} = \frac{g}{5} = 2m/s^2$

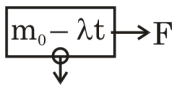


$a_{down} = \frac{mg\sin\theta + f_s}{m}$

$= g\sin\theta + \mu g\cos\theta$

$= \frac{3g}{5} + \frac{4g}{5} = \frac{7g}{5} = 14\ m/s^2$

6. **Ans (C)**



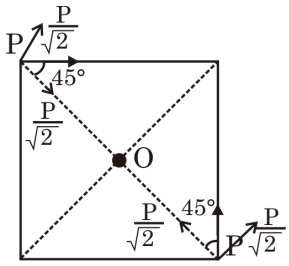
$$\vec{F} = (m_0 - \lambda t)\frac{d\vec{v}}{dt}$$

7. **Ans (B)**

$$v_f = 0,\ I = m\left(\sqrt{2g(2)} - 0\right) = 1\sqrt{40}\,N - S$$

$$I = \sqrt{40}\ N - S$$

8. **Ans (B)**



$$\text{for O :- } \frac{\frac{kp}{\sqrt{2}}}{\left(\frac{a}{\sqrt{2}}\right)^3} \times 2 = \frac{\frac{kp}{\sqrt{2}}.2}{\frac{a^3}{2\sqrt{2}}} = \frac{4kp}{a^3}$$

$$\text{for A :- } \sqrt{2}\frac{kp}{a^3}$$

$$\frac{E_0}{E_A} = \frac{4}{\sqrt{2}} = 2\sqrt{2}$$

10. **Ans (C)**

$$v_{disk} = \frac{\sigma}{2\epsilon_0}\left(\sqrt{R^2 + r^2} - r\right)$$

$$v_{quarter\ disk} = \frac{\sigma}{8\epsilon_0}\left(\sqrt{R^2 + r^2} - r\right)$$

11. **Ans (D)**

$$I = \int F\,dt = \int_0^{T_0} \left(600 - 2 \times 10^5 t\right) dt$$

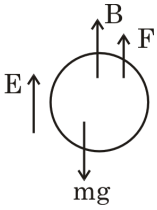
$$\text{for } T_0,\ F = 0 \Rightarrow 600 = 2 \times 10^5\ T_0 \Rightarrow T_0 = 3 \times 10^{-3}\ \text{sec}$$

$$I = 600\,T_0 - 2 \times 10^5 \frac{T_0^2}{2}$$

$$= 600 \times 3 \times 10^{-3} - 10^5 \times 9 \times 10^{-6}$$

$$= 9 \times 10^{-1} = 0.9\ N\text{–}S$$

12. **Ans (C)**



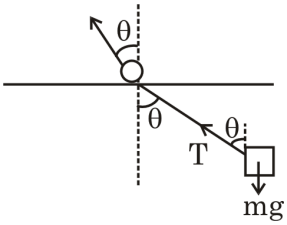
$$B + F = mg$$

$$\rho_0 \frac{4}{3}\pi R^3 g + qE = \rho.\ \frac{4}{3}\pi R^3 g$$

$$qE = (\rho - \rho_0)\frac{4}{3}\pi R^3$$

$$N = \frac{(\rho - \rho_0)\frac{4}{3}\pi R^3}{eE}$$

13. **Ans (D)**

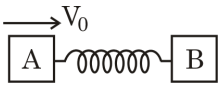


$$T = mg\cos\theta$$

$$\tan\theta = \mu$$

$$T = mg\frac{1}{\sqrt{1 + \mu^2}}$$

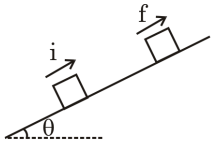
14. **Ans (D)**



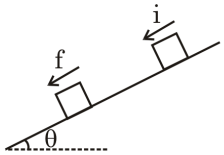
$$\frac{1}{2}\frac{2m}{3}.V_0^2 = \frac{1}{2}kx_0^2$$

$$k = \frac{2mV_0^2}{3x_0^2}$$

15. **Ans (D)**



$\Delta KE = -mg\sin\theta - \mu mg\cos\theta$



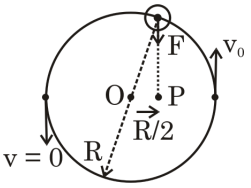
$\Delta KE = mg\sin\theta - \mu mg\cos\theta$

16. **Ans (B)**

$$F = -\frac{dU}{dr} = -\frac{km}{r^2}$$

$$\int dv = km \int \frac{dr}{r^2}$$

$$U = -\frac{km}{r} + C$$

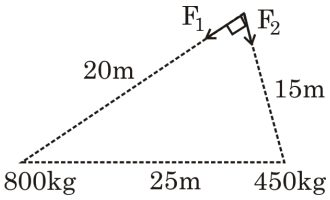


$$-\frac{km}{3R/2} + 0 = \frac{1}{2}mv_0^2 - \frac{km}{R/2}$$

$$\frac{1}{2}mv_0^2 = 2\frac{km}{R} - \frac{2km}{3R} = \frac{4km}{3R}$$

$$v_0^2 = \frac{8k}{3R} \Rightarrow v_0 = \sqrt{\frac{8k}{3R}}$$

19. **Ans (B)**



$$E_1 = -\frac{G(800)}{20^2} = -2G$$

$$E_2 = \frac{-G(450)}{15^2} = -2G$$

20. **Ans (B)**

$$V = \frac{kQ}{2R}\left(3 - \frac{r^2}{R^2}\right)$$

$$0 + \frac{kQq_1}{2R}\left(3 - \frac{1}{4}\right) = \frac{1}{2}mv^2 + \frac{kQq_1}{(2R)}$$

$$\frac{kQq_1}{2R}\left(\frac{11}{4}\right) = \frac{1}{2}mv^2 + \frac{kQq_1}{2R}$$

$$\frac{kQq_1}{R}\left(\frac{11}{8} - \frac{1}{2}\right) = \frac{1}{2}mv^2$$

$$\frac{7}{8} \cdot \frac{kQq_1}{R} = \frac{1}{2}mv^2$$

$$v = \frac{\sqrt{7}}{2}\sqrt{\frac{kQq_1}{mR}}$$

PART-1 : PHYSICS

SECTION-II

1. **Ans (4)**

$$v = \sqrt{\frac{2GM}{R}} \Rightarrow v \propto \frac{1}{\sqrt{R}}$$

$$\frac{v_1}{v_2} = \sqrt{\frac{R_2}{R_1}} \Rightarrow \frac{v}{10v} = \sqrt{\frac{R_2}{6400}}$$

$$R_2 = 64 \text{ km}$$

2. **Ans (3)**

$$N_1 = mg + ma = 80.5g$$

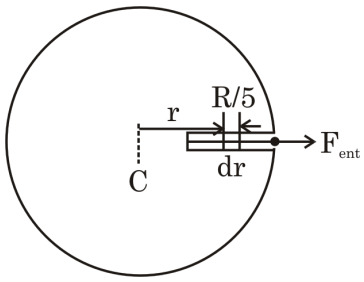
$$N_2 = mg - ma = 59.5\ g$$

$$2mg = 140\ g \Rightarrow m = 70 \text{ kg}$$

$$70g + 70\ a = 80.5\ g \Rightarrow 70\ a = 105$$

$$a = 1.5$$

3. **Ans (9)**



$$dF = \frac{\rho r}{3}(4\pi G)\lambda dr$$

$$= \frac{\rho\lambda}{3}.4\pi G r dr$$

$$F_{net} = \int dF$$

$$= \frac{\rho\lambda}{3}.4\pi G \int_{4R/5}^{R} r dr$$

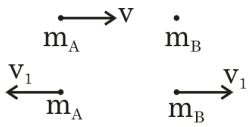
$$= \frac{\rho\lambda}{3}.4\pi G.\frac{\left(R^2 - \frac{16R^2}{25}\right)}{2}$$

$$F_{net} = \frac{\lambda}{3}.4\pi G\frac{GR^2}{50}.\frac{M}{\frac{4}{3}\pi R^3}$$

$$= \frac{9}{50}\left(\frac{GM}{R}\right)\lambda = \frac{9}{50}\left(\frac{GM}{R^2}\right)R\lambda$$

$$= \frac{9}{50} \times 1 \times 6 \times 10^5 \times 10^{-3} = 108 \text{ N}$$

4. **Ans (3)**



$m_A v = m_B v_1 - m_A v_1$

$m_A v = (m_B - m_A) v_1$

$e = 1 = \frac{v_1 + v_1}{v} = \frac{2v_1}{v} \Rightarrow \frac{v_1}{v} = \frac{1}{2}$

$\frac{m_A}{m_B - m_A} = \frac{1}{2} \Rightarrow 2m_A = m_B - m_A$

$m_A = \frac{m_B}{3}$

$\frac{m_B}{m_A} = \frac{3}{1}$

5. **Ans (4)**

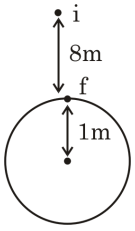
$mg(8) + \frac{kq^2}{9} = \frac{kq^2}{1} + 0$

$mg(8) = kq^2 . \frac{8}{9}$

$q^2 = \frac{9mg}{k}$

$q^2 = \frac{9 \times 80 \times 10^{-3} \times 9.8}{9 \times 10^9}$

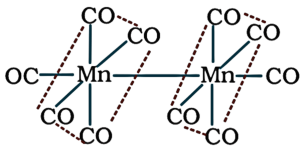
$q = 28\ \mu C$



PART-2 : CHEMISTRY

SECTION-I

1. **Ans (B)**



$[Mn_2(CO)_{10}]$

2. **Ans (B)**

$R - Cl + AlCl_3 \rightarrow R^{\oplus} + AlCl_4^-$

$RCOCl + AlCl_3 \rightarrow RCO^{\oplus} + AlCl_4^-$

Here both $R^{\oplus}$ and $RCO^{\oplus}$ are acting as electrophile.

3. **Ans (D)**

Ti^{+3} configuration : $3d^1$

t_{2g} : ground state of complex, e_g : next higher state

$\therefore$ e^- excites from t_{2g} to e_g

8. **Ans (C)**

$[Co(NH_3)_6]Cl_3 + 3AgNO_3 \rightarrow$
(aq)

$[Co(NH_3)_6]^{+3} 3NO_3^- + 3AgCl \downarrow$
$(white)$

9. **Ans (B)**

$[Fe(CN)_6]^{4-} \Rightarrow Fe^{+2}$: 6 valence electrons
e^-s from 6 $^-CN = 12$

Total 18 valence electrons

10. **Ans (C)**

set : 1 = d_{xy}, d_{yz}, d_{zx} : non − axial

set : 2 = $d_{z^2}, d_{x^2-y^2}$: axial

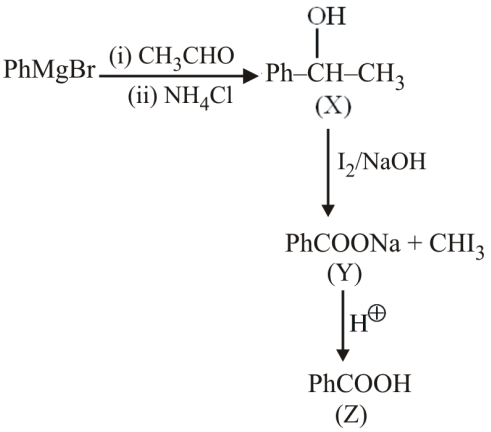
11. **Ans (D)**

The M-C π bond is formed by the donation of a pair electrons from a filled d orbital of metal into the vacant antibonding π^* of carbon monoxide.

18. **Ans (B)**

C_2H_6 has neither lone pair nor π-bond.

19. **Ans (D)**



20. **Ans (C)**

X = Polar $\Rightarrow$ cis - $[Pt(gly)_2]$

Y = Non-polar $\Rightarrow$ trans- $[Pt(gly)_2]$

PART-2 : CHEMISTRY

SECTION-II

1. **Ans (9480)**

$\Delta_0 < P \Rightarrow$ so no forced pairing.

CFSE = $3 \times (-0.4\Delta_0) + 1 \times (+0.6\Delta_0)$

$= -1.2\Delta_0 + -0.6\Delta_0 = -9480\ cm^{-1}$

2. **Ans (1263)**

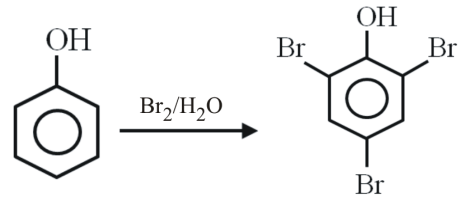
Moles of $Cl^- = 3 \times 0.0012 = 0.0036 =$ moles of H^+

moles of $H^+ =$ moles of ^-OH

$0.0036 = 28.5 \times 10^{-3} \times x$

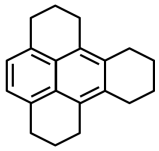
$x = 0.1263$

3. **Ans (3)**



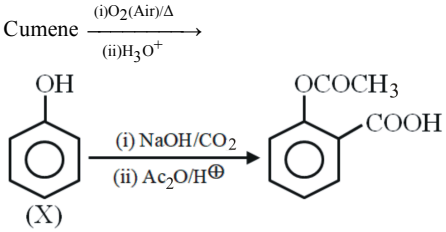
4. **Ans (10)**

Formed product is



Hence its degree of unsaturation is 10.

5. **Ans (4)**



PART-3 : MATHEMATICS

SECTION-I

1. **Ans (C)**

Normal at $(x_1\ y_1)$ be $xx_1 - yy_1 = x_1^2 - y_1^2$

Pass's through (3, 2)

$3x_1 - 2y_1 = x_1^2 - y_1^2$ ...(i)

Also $x_1y_1 = 4$ ...(ii)

So, $3x_1 - \frac{8}{x_1} = x_1^2 - \frac{16}{x_1^2}$

$3x_1^3 - 8x_1 = x_1^4 - 16$

$\Rightarrow x_1^4 - 3x_1^3 + 8x_1 - 16 = 0$

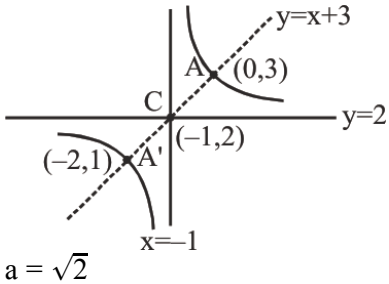
$\sum x_i = 3 \quad \prod x_i = -16$

So, $\frac{\sum x_i}{\prod x_i} = \frac{-3}{16}$

2. **Ans (D)**

$y = 2 + \frac{1}{x+1}$

$\Rightarrow (y-2)(x+1) = 1$



$a = \sqrt{2}$

Length of L.R. $= 2\sqrt{2}$

3. **Ans (D)**

Let circle $S \equiv x^2 + y^2 - a^2 = 0$

and given hyperbola $xy = c^2$

Then, $x^2 + \frac{c^4}{x^2} = a^2$ or $x^4 - a^2x^2 + c^4 = 0$

If four intersecting points are

$\left(ct_1, \frac{c}{t_1}\right)$, $\left(ct_2, \frac{c}{t_2}\right)$, $\left(ct_3, \frac{c}{t_3}\right)$ and $\left(ct_4, \frac{c}{t_4}\right)$, then

$(ct_1)(ct_2)(ct_3)(ct_4) = c^4$

$\therefore t_1\, t_2\, t_3\, t_4 = 1$

$\therefore$ Reason is true.

For the point (2, 2) ; $t_1 = 1$

For the point (4, 1) ; $t_2 = 2$

For the point (6, 2/3) ; $t_3 = 3$

For the point $\left(\frac{1}{4}, 16\right)$; $t_4 = \frac{1}{8}$

Now, $t_1\, t_2\, t_3\, t_4 = \frac{3}{4} \neq 1$

$\therefore$ Assertion is false.

4. **Ans (A)**

$e = \sqrt{1 - \frac{b^2}{a^2}} = \sqrt{1 - \frac{24}{49}} = \frac{5}{7}$

foci $= (\pm ae, 0) = (\pm 5, 0)$

$A \times \frac{5}{\sqrt{2}} = 5 \Rightarrow A = \sqrt{2}$ & $B^2 = A^2(e^2 - 1) = 23$

5. **Ans (B)**

Since each line of family of line passes through the focus of given parabola hence shortest intercept is L.R.

6. **Ans (C)**

minimum value of E is the shortest distance between the parabola $y^2 = 4x$ and circle

$(x+1)^2 + (y-14)^2 = 9$.

Thus normal to the parabola $y^2 = 4x$, be

$y = mx - 2m - m^3$ passes through $(-1, 14)$ gives $m^3 + 3m + 14 = 0$, Thus only one real value $m = -2$

Hence corresponding point on the parabola is $(4, 4)$

Thus required minimum distance is

$\sqrt{5^2 + 10^2} - 3 = 5\sqrt{5} - 3$

7. **Ans (A)**

$x^2 + y^2 + Ax + By + C = 0$

is passing through (0,0)

$C = 0$

The tangent of the parabola $y = x^2$ at (2, 4) is

$4x - y - 4 = 0$ .....(1)

The tangent of circle

$x^2 + y^2 + Ax + By + C = 0$ at (2, 4) is

$(4 + A)x + (8 + B)y + 2A + 4B = 0$ ....(2)

From Equation (1) and (2)

$$\frac{4+A}{4} = \frac{8+B}{-1} = \frac{2A+4B}{-4}$$

$A + 4B = -36$ ....(3)

$3A + 4B + 2C = -4$ ....(4)

Circle passes through (2, 4)

$A + 2B = -10$

From (3), (4) and (5)

$A = 16$

$B = -13$

8. **Ans (A)**

$x = 1$ is a root of the equation

$D = 0$

$$\Rightarrow \frac{-b}{2a} = 1 \Rightarrow \frac{r-q}{2p-2q} = 1$$

$r - q = 2p - 2q$

$2p - q - r = 0$

$-2p + q + r = 0$

$px + qy + r = 0$

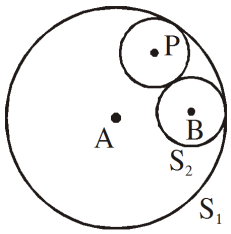
always passes through $(-2, 1)$

10. **Ans (C)**

$S_1 : x^2 + y^2 = 9$ $\begin{cases} r_1 = 3 \\ A(0, 0) \end{cases}$

$S_2 : (x-2)^2 + y^2 = 1$ $\begin{cases} r_2 = 1 \\ B(2, 0) \end{cases}$

$\because \quad c_1c_2 = r_1 - r_2$



$\therefore$ given circle are touching internally

Let a variable circle with centre P and radius r

$\Rightarrow PA = r_1 - r$ and $PB = r_2 + r$

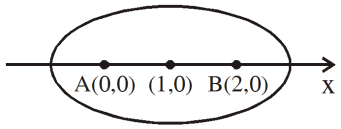
$\Rightarrow PA + PB = r_1 + r_2$

$\Rightarrow PA + PB = 4 (> AB)$

$\Rightarrow$ Locus of P is an ellipse with foci at A(0, 0) and B(2, 0) and length of major axis is $2a = 4$, $e = \frac{1}{2}$

$\Rightarrow$ centre is at (1, 0) and $b^2 = a^2(1 - e^2) = 3$

if x-ellipse



$$\Rightarrow E : \frac{(x-1)^2}{4} + \frac{y^2}{3} = 1$$

which is satisfied by $\left(2, \pm\frac{3}{2}\right)$

11. **Ans (C)**

$$\frac{3}{2a^2} + \frac{1}{b^2} = 1 \text{ and } 1 - \frac{b^2}{a^2} = \frac{1}{3}$$

$\Rightarrow a^2 = 3\ b^2 = 2$

$$\Rightarrow \frac{x^2}{3} + \frac{y^2}{2} = 1 \quad \text{.....(i)}$$

Its focus is (1,0)

Now, eqn of circle is

$$(x-1)^2 + y^2 = \frac{4}{3} \quad \text{.....(ii)}$$

Solving (i) and (ii) we get

$$y = \pm\frac{2}{\sqrt{3}}, x = 1$$

$$\Rightarrow PQ^2 = \left(\frac{4}{\sqrt{3}}\right)^2 = \frac{16}{3}$$

12. Ans (B)

equation of director circle

$x^2 + y^2 = a^2 + b^2$

$x^2 + y^2 = 25 + 16$

$x^2 + y^2 = 41$

13. Ans (B)

$S_1 < 0$

$$\frac{\left(7 - \frac{5h}{4}\right)^2}{25} + \frac{(-h)^2}{16} - 1 < 0$$

$\Rightarrow 25h^2 - 140h + 192 < 0$

$\Rightarrow (5h - 12)(5h - 16) < 0$

$\Rightarrow \frac{12}{5} < h < \frac{16}{5}$

$\therefore$ Integral value of h is 3

14. Ans (C)

$$\cos5°\cos55°\cos65° = \frac{1}{4}\cos15°$$

$$= \frac{1}{4}\cdot\frac{\sqrt{3}+1}{2\sqrt{2}} = \frac{\sqrt{3}+1}{8\sqrt{2}}$$

15. Ans (B)

BC

16. Ans (A)

$\cot A + \cot B = p \quad \cot A \cot B = q$

$$\frac{\sin(A+B)}{\sin A \sin B} = p \quad q - 1 = \frac{\cos(A+B)}{\sin A \sin B}$$

$$p^2 + (q-1)^2 = \frac{\sin^2(A+B)}{\sin^2 A \sin^2 B} + \frac{\cos^2(A+B)}{\sin^2 A \sin^2 B}$$

$$p^2 + (q-1)^2 = \frac{1}{\sin^2 A \sin^2 B}$$

$$(q-1)^2 = \frac{\cos^2(A+B)}{\sin^2 A \sin^2 B}$$

$$\cos^2(A+B) = \frac{(q-1)^2}{p^2 + (q-1)^2}$$

17. Ans (D)

$$S_k = \frac{k}{2}(2 \times 1 + (k-1) \times 1)$$

$$S_k = \frac{k}{2}(k+1)$$

$$\sum_{k=1}^{100} \frac{2}{k(k+1)} = \sum_{k=1}^{100}\left(\frac{2}{k} - \frac{2}{k+1}\right)$$

$$= 2 - \frac{2}{101} = \frac{200}{101}$$

$$S = \frac{200}{101} - 1$$

18. Ans (C)

$$\left(\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \frac{1}{4^2} + \ldots\ldots\infty\right)$$

$$-\left[\frac{1}{2^2} + \frac{1}{4^2} + \frac{1}{6^2} + \ldots\ldots\infty\right]$$

$$= \omega - \frac{1}{2^2}\left\{\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \ldots\ldots\ldots\infty\right\}$$

$$\omega - \frac{1}{4}\omega = \frac{3\omega}{4}$$

19. Ans (C)

2 (required sum) $= (1 - 1 + 2 - 2 + ... + n - n)^2 -$ $(1^2 + 1^2 + 2^2 + 2^2 + ... + n^2 + n^2)$

20. Ans (B)

We have, $2b^2 - a^2 > a^2 + b^2 \Rightarrow b^2 > 2a^2$

$$\Rightarrow \left|\frac{b}{a}\right| > \sqrt{2}$$

PART-3 : MATHEMATICS

SECTION-II

1. Ans (0)

Intersection point of tangent at vertex and tangent is $(-1, 1)$

Now equation of line which is $\perp$ from given tangent and passing through $(-1, 1)$ is

$y - 1 = -\frac{1}{2}(x + 1) \Rightarrow 2y - 2 = -x - 1$

$x + 2y = 1$

this line $x + 2y = 1$ and equation of axis satisfied the focus

$\therefore x + 2y = 1$ and $x = y \Rightarrow x = \frac{1}{3}, y = \frac{1}{3}$

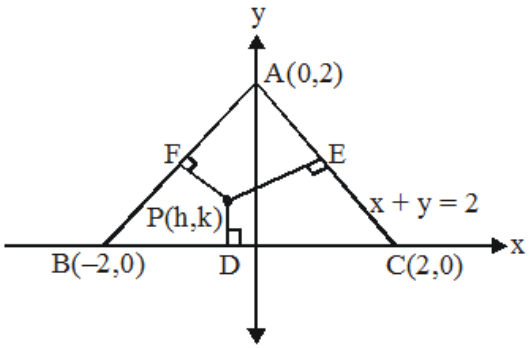
Now distance between focus and tangent at vertex is

$$a = \left|\frac{\frac{1}{3} + \frac{1}{3}}{\sqrt{2}}\right| \Rightarrow 4a = \frac{8}{3\sqrt{2}}$$

$$\Rightarrow 2a = \frac{4}{3\sqrt{2}} = L$$

$$= L^2 = \frac{8}{9}$$

2. Ans (16)



$$k^2 = \frac{1}{2}\cdot\left|\frac{h+k-2}{\sqrt{2}}\right|\cdot\left|\frac{h-k+2}{\sqrt{2}}\right|$$

$4k^2 = -(h + k - 2)(h - k + 2)$

$4k^2 = (h + k - 2)(-h + k - 2)$

$4k^2 = (k - 2)^2 - h^2$

$h^2 = (k - 2)^2 - 4k^2$

$h^2 = -3k^2 + 4 - 4k$

$h^2 + 3k^2 + 4k = 4$

$$h^2 + 3\left(k^2 + \frac{4}{3}k + \frac{4}{9}\right) - 3.\frac{4}{9} = 4$$

$$h^2 + 3\left(k + \frac{2}{3}\right)^2 = \frac{16}{3}$$

$$\frac{h^2}{\frac{16}{3}} + \frac{\left(k+\frac{2}{3}\right)^2}{\frac{16}{9}} = 1$$

$$e^2 = 1 - \frac{16/9}{16/3} = \frac{2}{3}$$

3. Ans (2)

Any point on hyperbola $(2\sec\theta, 3\tan\theta)$

chord of contact : $2\sec\sigma x + 3\tan\sigma y = 4$ ...(1)

equation of chord of circle, whose midpoint is (h,k)

$hx + ky = h^2 + k^2$ ...(2)

compare eq(1) and eq(2)

$$\frac{2\sec\theta}{h} = \frac{3\tan\theta}{k} = \frac{4}{h^2+k^2}$$

$$\sec\theta = \frac{2h}{h^2+k^2}, \tan\theta = \frac{4k}{3(h^2+k^2)}$$

$$\frac{4h^2}{(h^2+k^2)^2} - \frac{16k^2}{9(h^2+k^2)^2} = 1$$

$$\frac{(36x^2 - 16y^2)}{9} = (x^2+y^2)^2$$

$\frac{9}{4}(4x^2 - 9y^2) = (x^2 + y^2)$ locus of mid point

$b = \frac{36}{9}, c = \frac{16}{9}$

4. Ans (50)

$(2\sec^2A - \sec^4A) - (2\operatorname{cosec}^2A - \operatorname{cosec}^4A)$

$= \frac{15}{4}$

$\sec^2A(2 - \sec^2A) - \operatorname{cosec}^2A(2 - \operatorname{cosec}^2A)$

$= \frac{15}{4}$

$(1 - \tan^4A) - (1 - \cot^4A) = \frac{15}{4}$

Put $\tan^4A = t$ $\quad -t + \frac{1}{t} = \frac{15}{4}$

$$\frac{1-t^2}{t} = \frac{15}{4} \Rightarrow 4t^2 + 15t - 4 = 0$$

$4t^2 + 16t - t - 4 = 0$

$t = -4, \frac{1}{4}$

$\tan^4A = \frac{1}{4} \Rightarrow \tan^2A = \frac{1}{2}$

5. Ans (8)

Length of tangent $= \sqrt{\alpha\beta} = \sqrt{64} = 8$