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Test Pattern

ALLEN CAREER INSTITUTE KOTA (RAJASTHAN) path to success

CLASSROOM CONTACT PROGRAMME

(Academic Session : 2020 - 2021)

JEE(Advanced)
FULL SYLLABUS
20-05-2021

JEE(Main+Advanced) : ENTHUSIAST COURSE [SCORE-II (PHASE-STAR BATCH)]

ANSWER KEY

PART-1 : PHYSICS

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

PART-2 : CHEMISTRY

SECTION-I	Q.	1	2	3	4	5	6	7	8	9	10
	A.	B,C	A,B,C,D	A,B,C,D	A,C,D	A,B,D	A,B,C	A,B,D	D	B	A
	Q.	11	12	13							
	A.	D	B	D							
SECTION-III	Q.	1	2	3	4	5					
	A.	5	4	0	8	7					

PART-3 : MATHEMATICS

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

PART-1 : PHYSICS SOLUTION

SECTION-I

1. Ans. (B,D)

Sol. $r \propto \frac{1}{m}$

so m double, radius half

$E \propto m$

so IE will double and gap between levels will also double.

2. Ans. (A,B,D)

Sol. When water is in liquid state

$$w_g = \frac{3}{2}mgh = k = \left[\frac{1}{2}mv^2 + \frac{1}{2}\left(\frac{2}{3}mr^2\right)\frac{v^2}{r^2}\right] + \left[\frac{1}{2}\left(\frac{m}{2}\right)v^2\right]$$

water will have only translational KE when water is freezed

$$w_g = k' = \frac{3}{2}mgh = \frac{1}{2}mv'^2 + \frac{1}{2}\left(\frac{2}{3}mr^2\right)\frac{v'^2}{r^2} + \left[\frac{1}{2}\frac{m}{2}v'^2 + \frac{1}{2}\frac{2}{5}\frac{m}{2}r^2\frac{v'^2}{r^2}\right]$$

water will have translational as well as rotational KE so v' < v

3. Ans. (B, C, D)

Sol. $\rho = kr^2 = \frac{\rho_0}{R^2}r^2$

(A) $v_{esc} = \sqrt{\frac{2GM}{R}}$

$$M = \int_0^R \frac{\rho_0}{R^2}r^2 4\pi r^2 dr = \frac{\rho_0 4\pi}{R^2}\frac{R^5}{5} = \frac{\rho_0 4\pi R^3}{5}$$

$$\text{so } v_{esc} = \sqrt{\frac{2G\rho_0 4\pi R^3}{5R}} = \sqrt{\frac{8\pi G\rho_0 R^2}{5}}$$

(B) $g = \frac{GM}{r^2} = \frac{G}{r^2}\int_0^r \frac{\rho_0}{R^2}r^2 4\pi r^2 dr = \frac{G\rho_0 4\pi r^3}{5R^2}$

$g \propto r^3$

(C) as $v_{esc} = \sqrt{\frac{2GM}{R}}$ so will be same for other planet also.

(D) Energy required $= \frac{1}{2}mv_{esc}^2 \propto m$

so $\frac{E_1}{E_2} = \frac{1}{2}$

4. Ans. (A,B,D)

Sol. $V_A = \frac{Kq_A}{R} + \frac{Kq_B}{2R} = 2V,$

$$V_B = \frac{K(q_A + q_B)}{2R} = \frac{3}{2}V$$

$$\Rightarrow \frac{q_A}{q_B} = \frac{1}{2}$$

After earthing of B, $q'_A = q_A$ &

$$V'_B = \frac{K(q'_A + q'_B)}{2R} = 0$$

$$\Rightarrow \left|\frac{q'_A}{q'_B}\right| = 1 \ \& \ V'_A - V'_B = \frac{V}{2}$$

5. Ans. (B,C,D)

Sol. $|E| = nat^{n-1}$

6. Ans. (A, B)

Sol. $P = \frac{P_0}{2}\left[\sin\left(203\pi t + \frac{5\pi}{6}\right) + \sin\left(197\pi t + \frac{\pi}{6}\right)\right]$

$f_1 = \frac{203\pi}{2\pi} > 100$

$f_2 = \frac{197\pi}{2\pi} < 100$

$f_{beat} = \frac{203\pi}{2\pi} - \frac{197\pi}{2\pi} = 3$

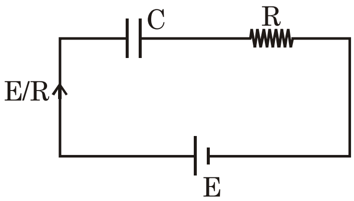
7. Ans. (A,B)

Sol. $\delta_{net} = \delta_1 + \delta_2 + ... + \delta_n$

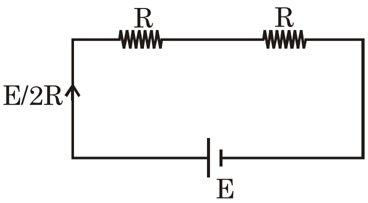
where all have same magnitude and alternate deviations are in opposite direction.

8. Ans. (B)

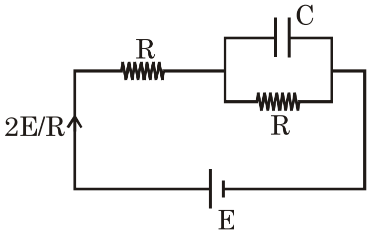
Sol. (I)



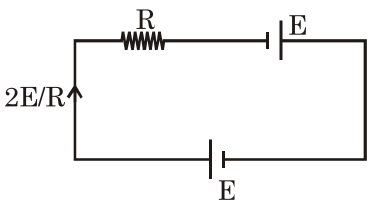
(II)



(III)



(IV)



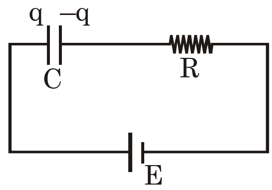
Current in III & IV is maximum

in (IV) no energy is stored as no capacitor

so ans (B) IV, i, Q

9. Ans. (A)

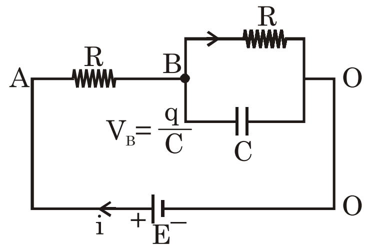
Sol. (I) At $t = RC$



$q = CE(1 - e^{-1})$ = charge drawn from battery $= 0.63\ CE$

(II) Charge drawn = $iRC = \frac{E}{2R}RC = 0.5CE$

(III)



$q = \frac{CE}{2}\left(1 - e^{\frac{-2t}{RC}}\right)$ $\qquad V_B = \frac{q}{C}$ & $V_A = E$

$i = \frac{v_A - v_B}{R} = \frac{E}{R} - \frac{E}{2R}\left(1 - e^{\frac{-2t}{RC}}\right)$

$= \frac{E}{2R} + \frac{E}{2R}e^{\frac{-2t}{RC}}$

Charge drawn = $\int_0^{RC} i\,dt = \frac{E}{2R}\int_0^{RC}\left(1 + e^{\frac{-2t}{RC}}\right)dt$

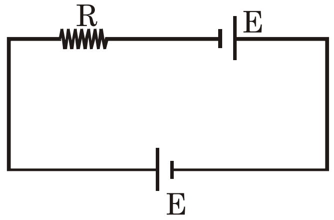
$= \frac{E}{2R}\left[\left(t + \frac{e^{-\frac{2t}{RC}}}{(-2)}(RC)\right)\right]_0^{RC}$

$= \frac{E}{2R}\left[\left(RC - \frac{RC}{2}e^{-2}\right) - \left(0 - \frac{RC}{2}\right)\right]$

$= \frac{E}{2R}\left[\frac{3RC}{2} - \frac{RC}{2}e^{-2}\right] = \frac{E}{2R}\frac{RC}{2}\left[3 - e^{-2}\right]$

$= \frac{CE}{4}\left(3 - e^{-2}\right) = 0.72\ CE$

(IV)



charge drawn = $\frac{2E}{R}RC = 2CE$

10. Ans. (D)

Sol. in (III) $i_{t=0} = \frac{E}{R}$

$i_{t=\infty} = \frac{E}{2R}$

11. Ans. (D)

Sol. (I) F_{ABCD} due to $\rho_1 = \left(\rho_1 g \frac{h}{2}\right) h\ell$;

(II) F_{ABCD} due to $\rho_2 = 0$

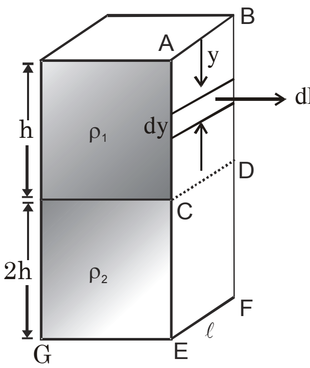
(III) F_{CDEF} due to $\rho_1 = \rho_1 gh(2h\ell)$;

(IV) F_{CDEF} due to $\rho_2 = (\rho_2 gh)(2h\ell)$

Pressure at face CDEF due to ρ_1 is constant to effectively acts at centre

12. Ans. (A)

Sol. (I)



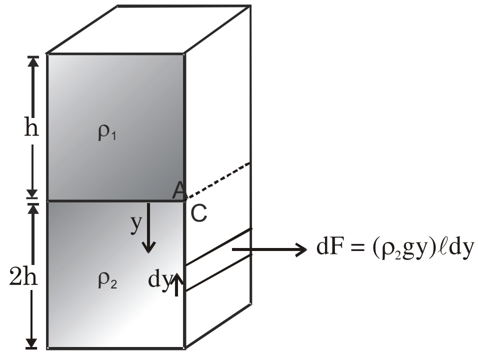
$$\int d\tau = \int_0^h (\rho_1 gy)\ell dy(3h - y)$$

$$\tau = \rho_1 g\ell\left[\frac{3hy^2}{2} - \frac{y^3}{3}\right]_0^h = \rho_1 g\ell \frac{7}{6}h^3$$

(II) $\tau = 0$

(III) $\tau = (\rho_1 gh)(2h\ell)(h) = 2\rho_1 gh^3\ell$

(IV)



$$\int d\tau = \int_0^{2h} (\rho_2 g\ell y dy)(2h - y)$$

$$\Rightarrow \tau = \rho_2 g\ell\left[2h\frac{y^2}{2} - \frac{y^3}{3}\right]_0^{2h}$$

$$= \rho_2 g\ell\left[h.4h^2 - \frac{8h^3}{3}\right] = \rho_2 g\ell\left[\frac{4h^3}{3}\right] = \frac{4\rho_2 g\ell h^3}{3}$$

so $\frac{7}{6}\rho_1 g\ell h^3 < \frac{4}{3}\rho_2 g\ell h^3$ (as $\rho_1 = \rho_2$)

so minimum torque in (I)

13. Ans. (D)

Sol. Weight of liquid $\rho_2 = \rho_2(2h\ell h)g = 2\rho_2\ell h^2 g$

SECTION-III

1. Ans. 5

Sol. From COAM

$$mv_0\frac{\ell}{6} = \left(2m\left(\frac{\ell}{3}\right)^2 + m\left(\frac{2\ell}{3}\right)^2\right)\omega$$

$$\omega = \frac{v_0}{4\ell}$$

From COM

$mv_0 = 3mv_{cm}$

$$v_{cm} = \frac{v_0}{3}$$

Loss in KE

$$= \frac{1}{2}mv_0^2 - \left\{\frac{1}{2}(3m)v_{cm}^2 + \frac{1}{2}I_{cm}\omega^2\right\}$$

$$= \frac{1}{2}mv_0^2 - \left\{\frac{1}{2}(3m)\left(\frac{v_0}{3}\right)^2 + \frac{1}{2}\left(\frac{2m\ell^2}{3}\right)\left(\frac{v_0}{4\ell}\right)^2\right\}$$

$$= \frac{15}{48}mv_0^2$$

2. Ans. 2

3. Ans. 9

Sol. Resistance of bulb, $R_{bulb}=\frac{V_{bulb}^2}{P_{bulb}}=0.5\Omega$

In order to the bulb glows at full intensity, current will pass through the

bulb $=\frac{4.5W}{1.5V}=3A$

equivalent resistance of circuit, R_{eq}

$=\frac{5}{3}+\frac{0.5\times1}{0.5+1}=\frac{5}{3}+\frac{0.5}{1.5}=\frac{5}{3}+\frac{1}{3}=2\Omega$

$\therefore$ Current supplied by battery $\frac{E}{R_{eq}}=\frac{E}{2}$

Current in bulb = I × $\frac{1}{(1+0.5)}$ ⇒3A =

$\frac{I}{1.5}=\frac{E}{2\times1.5}\Rightarrow$ E = 9 volt.

4. Ans. 5

Sol. Limiting friction between A & B = 90 N

Limiting friction between B & C = 80 N

Limiting friction between C & ground = 60 N

Since limiting friction is least between C and ground, slipping will occur at first between C and ground. This will occur when F = 60 N.

5. Ans. 2

Sol. $T = 2\pi\sqrt{\frac{I}{C}} \Rightarrow \frac{T'}{T}=\sqrt{\frac{I'}{I}}=\sqrt{\frac{\left(\pi\frac{4r^2}{2}\frac{t}{4}\right)4r^2}{\frac{(\rho\pi r^2 t)r^2}{2}}}$

T' = 2T

PART–2 : CHEMISTRY SOLUTION

SECTION-I

1. Ans.(B,C)

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

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

Sol. Borax on heating produces H_2O (neutral oxide) + $NaBO_2$ + B_2O_3.

4. Ans.(A,C,D)

Sol. Decompoition reactions are endothermic in nature

$\Delta_r S=\frac{\Delta_r H}{T}$ at equilibrium.

$\Delta_r G=\underbrace{\Delta_r H}_{+ve}-\underbrace{T\Delta_r S}_{-ve}\Rightarrow$

(–ve) at high temperature.

5. Ans.(A,B,D)

Soln. $Ag(s)+Cl^-+H^+\longrightarrow AgCl(s)+\frac{1}{2}H_2$

E = 0 – (0.18) – 0.06 log $\frac{1}{[H^+][Cl^-]}$

= –0.18 – 0.06 × 6 = – 0.54V

∴ Cell will be represented as : Pt | H_2 | HCl | AgCl | Ag & Cell potential = 0.54 V

$E^o_{Cl^-|AgCl|Ag}=E^o_{Ag^+|Ag}+0.06\log K_{sp}(AgCl)$

$0.18=E^o_{Ag^+|Ag}-0.06\times10 \Rightarrow E^o_{Ag^+|Ag}=0.78$ volt

6. Ans.(A,B,C)

7. Ans.(A,B,D)

8. Ans.(D)

0.1 M HCOOK

$\Delta T_f = iK_f m \simeq 2\times0.1\times K_f = 0.2\,K_f$

$\pi\simeq0.2RT$

$pOH=\frac{1}{2}[pK_w-pK_a-\log C]=\frac{1}{2}[14-4+1]=5.5$

pH = 8.5

Electrolysis products :

CO_2, H_2 at anode

: H_2 at cathode

9. Ans.(B)

0.1 m $Ca(NO_3)_2$

$\Delta T_b = iK_bm = 0.3\ K_b$

$\pi \simeq 0.3RT$

Electrolysis products : H_2 at cathode : O_2 at anode

pH = 7 (salt of S.A + S.B)

10. Ans.(A)

0.1 M CH_3COONa + 0.2 M CH_3COOH $\Rightarrow$ Acidic buffer solution

$\pi = (i_1M_1 + i_2M_2)RT \simeq (0.1\times2+0.2)RT$

$\simeq 0.4RT$

Electrolysis products : H_2 at cathode

: CO_2, C_2H_6 at anode mainly

$pH = pK_a + \log\frac{0.1}{0.2} = 5 - 0.3 = 4.7$

11. Ans.(D)

12. Ans.(B)

13. Ans.(D)

SECTION-III

1. Ans.(5)

Sol. B = CO_2

D = C_2H_2

2. Ans.(4)

(iii), (iv), (v), (vii)

3. Ans.(0)

Sol. x = 3 (K, Rb, Cs)

y = 2 (Mg, Be)

u = 5 (Concentrated solution of all alkali metals in liquid ammonia is blue coloured solution)

4. Ans.(8)

5. Ans .(7)

Solution: $\underset{(l-\text{form})}{B} \underset{k_b}{\overset{k_f}{\rightleftharpoons}} \underset{(d-\text{form})}{A}$

	B	A
t=0	a	0
t	a–x	x
t= t_{eq}	$(a-x_{eq})$	x_{eq}

at equilibrium $\frac{dx}{dt} = k_f(a-x_{eq}) - k_b x_{eq} = 0$

$$\Rightarrow \quad K_{eq} = \frac{k_f}{k_b} = \frac{x_{eq}}{a-x_{eq}}$$

Where, $x_{eq} = \frac{a}{2} \Rightarrow k_f = k_b$

$$(k_f + k_b) = \frac{2.303}{t}\log\left(\frac{x_{eq}}{x_{eq}-x}\right)$$

$$\Rightarrow \quad 2k_f = \frac{2.303}{230.3}\log\frac{a/2}{a/2 - a/10} = \frac{1}{100}\log\frac{0.5}{0.4}$$

$$= \frac{1}{100}(0.7-0.6) = 10^{-3}\,s^{-1}$$

$\therefore$ $k_f = 5\times10^{-4}\,s^{-1} = k_b$

$\therefore$ $K_{eq} = 1 \Rightarrow \Delta_rG^o = 0, \Delta_rG = -ve$

As A & B are enantiomers

$\Rightarrow (S_m^o)_A = (S_m^o)_B$

and $\Delta_rH^o = 0, \Delta_rH = 0$

PART-3 : MATHEMATICS — SOLUTION

SECTION–I

1. Ans. (B,D)

Sol. $\vec{a}\times\vec{b} = x\vec{a} + y\vec{b} + z\vec{c}$. Let $\vec{a} = \lambda\vec{b}\times\vec{c}$. $\lambda = \frac{1}{2}$

So, $\frac{\vec{b}\times\vec{c}}{2}\times\vec{b} = \frac{x}{2}\vec{b}\times\vec{c} + y\vec{b} + z\vec{c}$

$\Rightarrow -\frac{\vec{b}}{2} + \frac{\vec{c}}{6} = \frac{x}{2}\left(\vec{b}\times\vec{c}\right) + y\vec{b} + z\vec{c}$

$\Rightarrow x = 0,\ y = -\frac{1}{2},\ z = \frac{1}{6}$

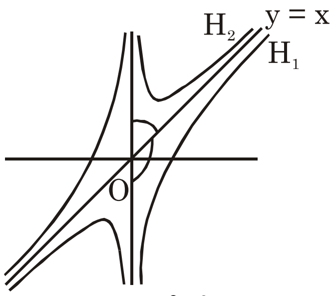
2. Ans. (B,D)

Sol. Integrating we get ; $x^2 + (f(x))^2 + (f'(x))^2 = k$

so, f(x) and f′(x) are bounded

3. Ans. (A,D)

Sol.



asymptote of $x^2 = xy + 1$ and $x^2 + 1 = xy$ are $x^2 - xy = 0$
and $y^2 - xy - 1 = 0$ and $x^2 - xy + 1 = 0$ are conjugate of each other

$\Rightarrow \frac{1}{e_1^2} + \frac{1}{e_2^2} = 1$ (direct result)

for $x^2 + 1 = xy$ if we rotate the conic by $\frac{\pi}{8}$ it will be of the form $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$

with asymptotes $y = \pm\frac{b}{a}x \Rightarrow \frac{b}{a} = \tan\frac{\pi}{8}$

$\Rightarrow e_2^2 = 1 + \frac{b^2}{a^2} = \frac{1}{1+\cos\frac{\pi}{8}}$

$\Rightarrow \frac{1}{e_1^2} = 1 - \frac{1}{e_2^2} = 1 - \frac{1}{\sec\frac{\pi}{8}} = 1 - \cos\frac{\pi}{8}$

$$\Rightarrow \left.\begin{aligned} e_1^2 &= \frac{1}{1-\cos\frac{\pi}{8}} \\ e_2^2 &= \frac{1}{1+\cos\frac{\pi}{8}} \end{aligned}\right\} \Rightarrow e_1 > e_2$$

4. Ans. (D)

Sol. $p = \frac{2^{2\times 2}}{2^{3\times 3}} = \frac{1}{32}$

$$A = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}$$

Total number of matrices = 2^9

$(s_1s_2s_3t_1t_2t_3)$ is odd integer if

(1) all the elements are 1 (no of matrices = 1)

(2) four zeros and five ones (no of matrices = 9)

(zeros must occupy all the positions of any minor)

(3) six zeroes and three ones
(no of matrices = 6)

$({}^3C_1.{}^2C_1.1)$

$\Rightarrow$ required probability $= \frac{16}{2^9} = \frac{2^y}{2^9}$

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

Sol. Given $AA^T = I$ and $|A| = 1$

(A) $|A - I| = |A - AA^T| = |I - A^T|$

$= |(I - A^T)^T|$

$|A - I| = |I - A| = -|A - I|$

$\Rightarrow |A - I| = 0$

(B) $|A^2 - I| = |A^2 - AA^T|$

$= |A|\,|A - A^T| = |A - A^T|$

since $A - A^T$ is skew symmetric

$\Rightarrow |A - A^T| = 0 \Rightarrow$ hence is not invertible

(C) $|A - A^T| = 0 \Rightarrow (A - A^T)^2$ is not invertible

(D) (A – (det A)) = A – I is not invertible

6. Ans. (B,C,D)

Sol. Replace x by –x we get ;

$(2x^2+2x+1)^n=\sum_{r=0}^{2n}a_rx^r$

So, $\sum_{r=0}^{2n}a_r=5^n,\sum_{r=0}^{2n}(-1)^ra_r=1$. Also, $a_0=1$

again,

$\sum_{r=0}^{2n}a_rx^r=\left((x+1)^2+x^2\right)^n=\sum {}^nc_kx^{2k}(x+1)^{2n-2k}$

$=\sum\left[{}^nc_k\sum{}^{2n-2k}c_tx^{2n-t}\right]$

$\Rightarrow$ comparing coeff. of x^{2n-r}, we get $\sum{}^nc_k{}^{2n-2k}C_r=a_{2n-r}=2^{n-r}a_r$

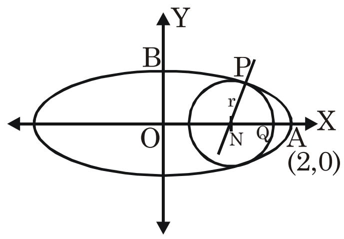
Also, $\sum_{r=0}^{2n}(-1)^r.a_ra_{2n-r}=$ coeff. of x^{2n}

in $\left((2x^2-2x+1)^n(2x^2+2x+1)^n\right)$

= coeff. of x^{2n} in $(4x^4+1)^n=0$ if n odd.

7. Ans. (B,C)

Sol. $\frac{x^2}{4}+\frac{y^2}{3}=1$



$N\equiv(k,0)$ & $Q(r+k,0)$

Normal PN at

$P(2\cos\theta,\sqrt{3}\sin\theta)$; $\theta\neq\frac{n\pi}{2}$ is

$2x\sec\theta-\sqrt{3}\,y\operatorname{cosec}\theta=1$

$\Rightarrow N\equiv\left(\frac{\cos\theta}{2},0\right)\Rightarrow k=\frac{\cos\theta}{2}\in\left(0,\frac{1}{2}\right)$

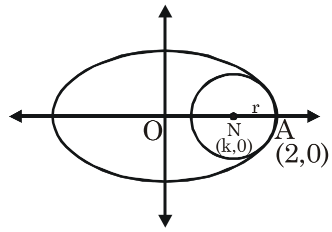
[as $k>0$ & $\theta\neq\frac{n\pi}{2}$]

So, all such circles touches the arc of the ellipse in the I[st] (as well as 4[th]) quadrant between (strictly) A & B.

Thus, $0<k<\frac{1}{2}$ & $r+k<2$ (as $Q_x<A_x$)

Now, these is another possibility when point of normalcy is A (note it cannot be B otherwise k = 0)

In this case,



$r+k=2$

So, circle is

$(x-k)^2+y^2=(2-k)^2$

Intersecting it with given ellipse :

$3x^2+4[(2-k)^2-(x-k)^2]=12$

$\Rightarrow x^2-8kx+16k-4=0$

$\Rightarrow x=2,\ 8k-2$

Since, the circle lies completely inside the ellipse So, other point of intersection (i.e. $x=8k-2$) should be imaginary.

Hence, $8k-2>2$ (Note $8k-2>-2$ as $k>0$)

$\Rightarrow k>\frac{1}{2}$ & $r+k=2$

(Matching Type)

Answer Q.8, Q.9 and Q.10

Sol. $x+y=1$ represents a line

$x^2+y^2=1$ represents a circle one of whose tangents is $x+y=\sqrt{2}$ at point $\left(\frac{1}{\sqrt{2}},\frac{1}{\sqrt{2}}\right)$

where as, $\sqrt{x}+\sqrt{y}=1\Rightarrow y=1+x-2\sqrt{x}$

$\Rightarrow 4x=(1+x-y)^2$ represents a parabola.

and $\frac{1}{x}+\frac{1}{y}=1$ represents a hyperbola.

8. Ans. (C)

9. Ans. (C)

10. Ans. (D)

Answer Q.11, Q.12 and Q.13

Sol. (P) $[x]\{x\}=1\Rightarrow x\in\left\{n+\frac{1}{n}:n\in I,n\geq 2\right\}$

(Q) $[x]\{x\}=1\Rightarrow x\in\left\{n+\frac{1}{|n|}:n\in I,|n|\geq 2\right\}$

(R) $\left[x\left[\frac{1}{x}\right]\right]=1\Rightarrow x\in(-2,0)\cup\left\{\frac{1}{n}:n\in I^+\right\}$

(S) $\{x\}+\left\{\frac{1}{x}\right\}=1\Rightarrow x\in\left\{\frac{n\pm\sqrt{n^2-4}}{2}:n\in I,|n|\geq 3\right\}$

11. Ans. (B)

12. Ans. (D)

13. Ans. (C)

SECTION-III

1. Ans. 7

Sol. at $A=\frac{\pi}{7}, B=\frac{2\pi}{7}, C=\frac{4\pi}{7}$ which are angles of a triangle.

So, x = tanA, y = tanB, z = –tanC.

$$\frac{1}{2}(x^2+y^2+z^2-x^2y^2z)$$

$$=\frac{1}{2}\left[\tan^2 A+\tan^2 B+\tan^2 C-(\tan A\tan B\tan C)^2\right]$$

$$=-(\tan A\tan B+\tan B\tan C+\tan C\tan A)$$

$$=-\frac{\sin A\sin B\cos C+\sin B\sin C\cos A+\sin C\sin A\cos B}{\cos A\cos B\cos C}$$

$$=\frac{\cos(A+B+C)-\cos A\cos B\cos C}{\cos A\cos B\cos C}$$

$$=-\frac{1}{\cos\frac{\pi}{7}\cos\frac{2\pi}{7}\cos\frac{4\pi}{7}}-1=8-1=7.$$

2. Ans. 6

Sol. $f'(x)=0\Rightarrow x=-\frac{9}{5a},\frac{1}{a}$

As, a < 0 and maxima comes first so,

$$\frac{1}{a}=-\frac{5}{9}\Rightarrow a=-\frac{9}{5}\text{ and }\alpha=1$$

Now, $f(1)>0\Rightarrow b>\frac{36}{5}\ \Rightarrow a+b>\frac{27}{5}$

3. Ans. 5

Sol. Let $t=\frac{x^3-3x+1}{x^2-x}=\frac{(x^2-x)(x+1)-(x-1)-x}{x^2-x}$

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

So, $I=\int_{-\frac{17}{12}}^{-\frac{1}{6}}\frac{1}{t^2}dt=\left(-\frac{1}{t}\right)\Big|_{-17/12}^{-1/6}=6-\frac{12}{17}=\frac{90}{17}$

(for x = –2, $t=-\frac{1}{6}$ and for x = –3,

$t=-\frac{17}{12}$)

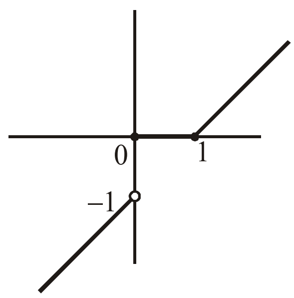
4. Ans.4

Sol. g is symmetrical about

$x=\frac{\pi}{2}$. $g_{max}=g\left(\frac{\pi}{2}\right)=2f\left(\frac{\pi}{2}\right)=4$

5. Ans. 2

Sol.



Not differentiable at x = 0, 1