FIITJEE **JEE(Advanced)-2017**

ALL INDIA TEST SERIES

In JEE Advanced 2016, FIITJEE Students bag 36 in Top 100 AIR, 75 in Top 200 AIR, 183 in Top 500 AIR. 3541 Students from Long Term Classroom/ Integrated School Program & 4423 Students from All Programs have qualified in JEE Advanced, 2016

ANSWERS, HINTS & SOLUTIONS

FULL TEST – I
(Paper-1)

Q. No.	PHYSICS	CHEMISTRY	MATHEMATICS
1.	C	C	D
2.	A	A	B
3.	C	A	A
4.	A	C	C
5.	B	A	C
6.	C	B	A
7.	ABCD	BC	CD
8.	ABD	ABCD	B
9.	BD	BD	ACD
10.	C	B	C
11.	A	A	D
12.	A	B	C
13.	C	C	C
14.	B	B	A
1.	(A) $\to$ q, (B) $\to$ p, (C) $\to$ r, (D) $\to$ p	(A) $\to$ p, r, (B) $\to$ s, t, (C) $\to$ t, (D) $\to$ q	(A) $\to$ r, t, (B) $\to$ p, q, r (C) $\to$ p, q, s, (D) $\to$ p, q, r, s
2.	(A) $\to$ s, (B) $\to$ q, (C) $\to$ p, (D) $\to$ p	(A) $\to$ s, t (B) $\to$ p, r, (C) $\to$ p, s, (D) $\to$ p, r	(A) $\to$ r, t, (B) $\to$ p, q, (C) $\to$ p, (D) $\to$ p
1.	1	3	7
2.	3	7	1
3.	2	0	2
4.	7	6	5
5.	2	1	9

Physics

PART – I

SECTION – A

1. C

The maximum velocity of the insect is $A\sqrt{\frac{k}{M}}$ its component perpendicular to the mirror is

$A\sqrt{\frac{k}{M}}\sin 60^o$.

Thus maximum relative speed = $\sqrt{3}\ A\sqrt{\frac{k}{M}}$

2. A

The slope $\tan\theta = \frac{PV}{T} = nR$

$= \frac{m}{M}R$

$M_{H_2} < M_{He} < M_{CO_2}$

$\Rightarrow (\tan\theta)_{H_2} > (\tan\theta)_{He} > (\tan\theta)_{CO_2}$

3. C

Since velocity is constant

$\text{emf} = \left|\frac{d\phi}{dt}\right| = BLV = \text{constnat}$

$\because$ potential difference across capacitor is constant and energy stored in the capacitor

$= \frac{1}{2}ce^2 = \frac{1}{2}C\left(B^2L^2V^2\right)$

Flux increases in the loop AEFBA, therefore current will flow in this loop in anticlockwise direction.

4. A

$A = A_0e^{-\lambda t} \Rightarrow \frac{6}{100} = e^{-\frac{\ln 2}{T_{\frac{1}{2}}}t}$

$\frac{1}{2^{\frac{t}{T_{\frac{1}{2}}}}} = \frac{6}{100} \Rightarrow \frac{1}{2^4}$

$T_{\frac{1}{2}} = 30\text{ mm}$

5. B

By the work – energy theorem

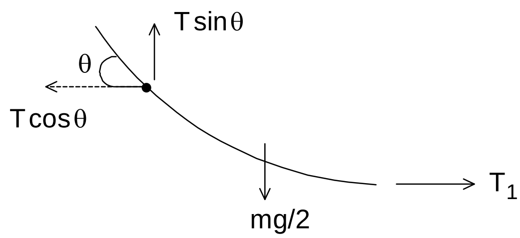
Charge in K.E. = work done by all the forces

$\frac{1}{2}(m)\left(5^2\right) = 0 = xqE_0$

$x = \frac{25m}{2qE_0}$

6. C

T be the tension at each points A & B



Apply Newtons law.

7. ABCD

Let l_1 and l_2 be the length of the air column for the first and the second resonance respectively with a tuning fork of frequency f .

Then $\lambda = 2(l_2 - l_1)$

From relation, $v = f\lambda$

$$v = 2f(l_2 - l_1)$$

$$= 2 \times 480 \times (51cm - 16cm) = 336 m/s$$

If T be the temperature of the air in air column of the resonance tube.

Then from formula,

$$\frac{\nu}{\nu_o} = \sqrt{\frac{T}{T_o}}$$

$$T = T_0\left(\frac{v}{v_0}\right)^2 = 273\left(\frac{336}{330}\right)^2 = 283K$$

Also $\frac{\lambda}{4} = l_1 + e = 16cm + 0.3d = \frac{v}{4f} = \frac{336}{4 \times 480}m$

Therefore $d = 5cm$

Again

$$\frac{\Delta v}{v} \times 100\% = \frac{\Delta l_2 + \Delta l_1}{l_2 - l_1} \times 100\% = \frac{4}{7}\%$$

And $\frac{\Delta T}{T} \times 100\% = 2 \times \frac{\Delta l_2 + \Delta l_1}{l_2 - l_1} \times 100\% = \frac{8}{7}\%$

8. ABD

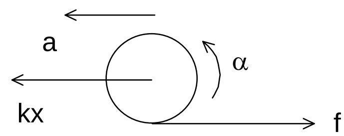
$\lambda \to \lambda/\mu_1$ shifting will be upward, for $\mu_3 = \mu_1$ x μ_2 the upward and downward shifts will cancel together

9. BD

Non zero external force must accelerate the centre of mass.

10-11. C – A

At displacement x



For disc rolling

$a = \alpha R$

$$\frac{kx - f}{m} = \frac{(fR)}{\frac{1}{2}mR^2} = \frac{2f}{m}$$

$$f = \left(\frac{k}{3}\right)A$$

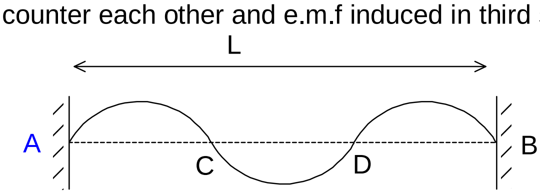
The cylinder is starting from x = A

$x = A\cos wt$

$$f = \frac{kA}{3}\cos wt$$

12. A

Maximum e.m.f induced will be when the string passes through mean position. e.m.f induced in segment AC and CD will counter each other and e.m.f induced in third segment will be maximum.



$$L = \frac{3\lambda}{2}$$

e.m.f induced in eliminated part

$$B\ell V = \int_{\frac{2L}{3}}^{L} B\left(2A\sin(kx)\omega\right)dx$$

$$= 2BA\omega\int_{\frac{2L}{3}}^{L}\sin(kx)dx$$

$$= -\frac{2BA\omega}{k}\left[\cos(kx)\right]_{\frac{2L}{3}}^{L}$$

$$= -\frac{2BA\omega}{k}\left[\cos\left(\frac{2\pi}{x}.L\right) - \cos\left(\frac{2\pi}{x}.\frac{2L}{3}\right)\right]$$

$$\left[\cos\left(\frac{2\pi}{2L}\times L\right) - \cos\left(\frac{2\pi}{2L}\times\frac{2L}{3}\right)\right]$$

$$= -\frac{2BA\omega}{k}\left[\cos(\omega\pi) - \cos(2\pi)\right] = \frac{4BA\omega}{k}$$

13. C

e.m.f will be maximum at one fourth of time period

i.e $t = \dfrac{\pi}{2\omega}$

14. B
In 2^{nd} harmonic two parts counter each other.

SECTION – B

1. $(A \to q)$ $(B \to p)$ $(C \to r)$ $(D \to p)$
Due to centrifugal force clockwise torque will increase to counter this N_2 will increase.

2. $(A \to s)$ $(B \to q)$ $(C \to p)$ $(D \to p)$
Current through the inductor at t = 0 is equal to 3A

$$I = I_0 e^{-\frac{t}{\tau}}$$

$$\tau = \frac{L}{R_a q} = \frac{9}{9} = 1$$

$$I_0 = 3A$$

SECTION – C

1. 1
Change in Potential energy of the system in both figure is same

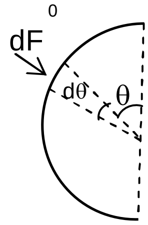
2. 3

$$\lambda = \frac{h}{P} = \frac{h}{\sqrt{2qVm}}$$

Or $\lambda \propto \frac{1}{\sqrt{qm}}$

3. 2

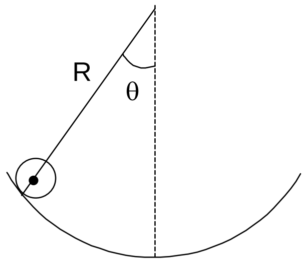
$$f_v = \int_0^R \rho g(2R - R\cos\theta)(LRd\theta)\cos\theta$$



$$= L\rho g R^2 \int_0^R (2\cos\theta - \cos^2\theta)d\theta$$

$$= \rho g L R^2 \frac{\pi}{2}$$

4. 7



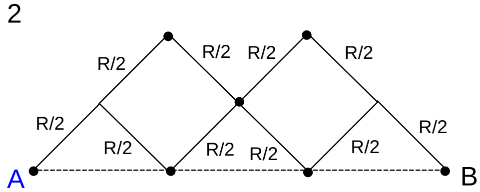
$$a = \frac{g\sin\theta}{1+\frac{k^2}{r^2}}$$

$$a = \frac{g}{\left(1+\frac{k^2}{r^2}\right)}\frac{x}{(R-r)}$$

$$a = -w^2x$$

$$w = \sqrt{\frac{g}{(R-r)\left(1+\frac{k^2}{r^2}\right)}}$$

5. 2



Chemistry PART – II

SECTION – A

1. C

p-xyloquinone	+ methylene white	$\rightleftharpoons$	p-xylohydroquinone	+	methylene blue
0.012	0		0.24		10^{-3}
$0.012 + 4 \times 10^{-5}$	4×10^{-5}		$0.24 - 4 \times 10^{-5}$		0.96×10^{-3}
$\cong 0.012$			$\cong 0.24$		

$$K = \frac{0.24 \times 0.96 \times 10^{-3}}{0.012 \times 0.04 \times 10^{-3}} = 480$$

2. A

Mole of NaCl = 0.1 & $MgCl_2$ = 0.1 (assuming mass of solution = 100 gm)
Mass of solvent = 84.65 gm

$i_{NaCl} = 1 + (n-1).\alpha$ and $i_{MgCl_2} = 1 + (n-1).\alpha$

$= 1.8$ $\quad\quad= 2$

$\Delta T_b = K_b \times m \times i$

$\Delta T_b = 2.29$

b.p of solution = (100 + 2.29) ^oC
= 102.29 ^oC

3. A

Let $NaHCO_3$ = X gm
Na_2CO_3 = Y gm
At HPh end point

$$Na_2CO_3 + HCl \longrightarrow NaHCO_3 + NaCl$$

millimole of HCl $= 0.15 \times 10 = 1.5$

millimole of $Na_2CO_3 = 1.5$

$\frac{Y}{106} \times 1 \times 10^3 = 1.5 \quad Y = 0.159$ g

At MeOH end point, $\left(\frac{X}{84}\right) + \left(\frac{Y}{106}\right) \times 2 = 0.15 \times 35 \times 10^{-3}$

Putting value of Y/106, we get X
X = 0.189 g
$\therefore$ wt of KCl = 0.5 – 0.159 – 0.189 = 0.152 g

$$\% \text{ of } Na_2CO_3 = \frac{0.159 \times 100}{0.5} = 31.8\%$$

$$\% \text{ of } NaHCO_3 = \frac{0.189 \times 100}{0.5} = 37.8\%$$

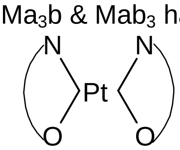
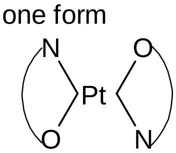
$$\% \text{ KCl} = \frac{0.152 \times 100}{0.5} = 30.4\%$$

4. C

$$\underset{(p)}{MgCl_2 + Ca(OH)_2} \longrightarrow Mg(OH)_2\downarrow \xrightarrow[(q)]{+\ HCl\ (aq)} MgCl_2 + H_2O$$

$$MgCl_2 + H_2O \xrightarrow{\text{crystallisation}} \underset{(r)}{MgCl_2.6H_2O} \xrightarrow[(s)]{\text{heating in presence of dry HCl (s) to avoid its hydrolysis by water of crystallisation to MgO}} MgCl_2$$

$$MgCl_2 \xrightarrow[(t)]{\text{Electrolytic reduction in molten state}} Mg$$

5. A
(A) tetrahedral compounds can't show geometrical isomerism because positions are equivalent in tetrahedral geometry.
(B) gives cis & trans isomer
(C) Ma_3b & Mab_3 have only one form
(D)

cis

trans

6. B
$$\frac{r^+}{r^-} = \frac{0.221}{0.95} = 0.225$$
So, C.No. = 4

7. BC
the half cell which has higher value of SRP undergo reduction
$$Cl_2(aq) + 2e^- \longrightarrow 2Cl^-(aq) \quad E^o_{Cl_2/Cl^-} = 1.36\,V$$
$$Br_2(aq) + 2e^- \longrightarrow 2Br^-(aq) \quad E^o_{Br_2/Br^-} = 1.09\,V$$
Cl_2 will undergo reduction & Br^- will undergo oxidation.
$$Cl_2(aq) + 2Br^-(aq) \longrightarrow 2Cl^-(aq) + Br_2(aq) \quad E^o_{cell} = 0.27\,V$$
$\Delta G^o = -ve$ spontaneous
(C) $S_2O_8^{2-}$ have higher SRP.

8. ABCD
Z < 1. Intermolecular attractive force dominates.

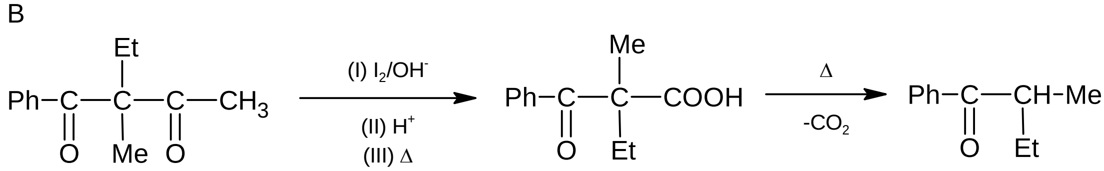
9. BD

$$3SO_2 + 3H_2O \longrightarrow 3H_2SO_3$$

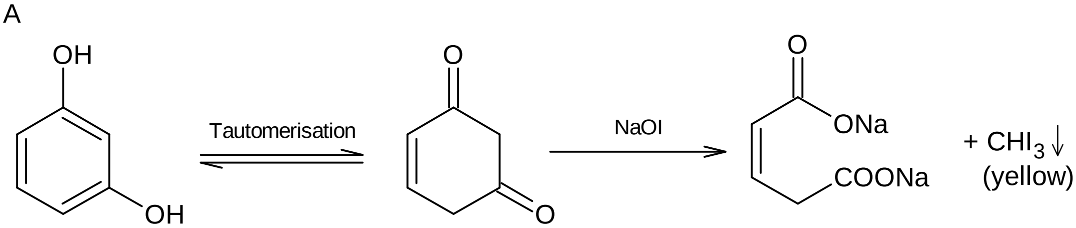
$$3H_2SO_3 \xrightarrow{150^{\circ}C} \underset{\text{(White turbidity)}}{S} + 2H_2SO_4 + H_2O$$

$$H_2SO_4 \xrightarrow{BaCl_2} BaSO_4\downarrow \text{(white ppt.)}$$

10. B



11. A



12. B

$$\frac{K_1}{K_2} = \frac{1}{2} = \frac{[B]}{[C]} = \frac{x}{y}$$

$t = 0 \quad A_o$

$t = t_0 \quad A_o - x - y$

$x + y = \frac{A_o}{2} = \frac{2}{2} = 1 \quad ......(1)$

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

Putting value of x in equation (1)

$x = \frac{1}{3}$ & $y = \frac{2}{3}$

$n_T = n_A + n_B + n_C = 1 + \frac{2}{3} + \frac{4}{3} = \frac{9}{3} = 3$

13. C

$$\frac{n_B}{n_C} = \frac{k_1}{k_2} = \frac{1}{2} = \frac{x}{y}$$

$2x + 2y = 75\%$ of 2 mole $= 1.5$

$\therefore$ solving the above equations, we get

$n_B = 2x = 0.5$ mole

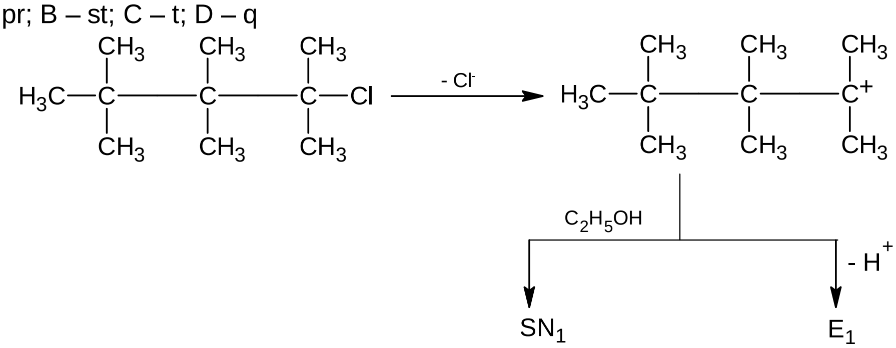
14. B

$\frac{n_B}{n_C} = \frac{K_1}{K_2}$ at any time

SECTION – B

1. A – pr; B – st; C – t; D – q

(A)



(B) SN^2 & E_2 reaction

(C) SN^2 reaction

(D) E_1 CB reaction due to presence of poor leaving group OH^- ion.

2. A – s; B – pr; C – ps; D – pr

For all reversible process

$\Delta S_{total} = 0$

For irreversible process $\Delta S_T > 0$

(A) $\Delta S_{system} = nC_V \ln\frac{T_2}{T_1} + nR\ln\frac{V_2}{V_1}$ $\left[T_1V_1^{\gamma-1} = T_2V_2^{\gamma-1}\right]$

$\Delta S = 0$

$\Delta S_{surrounding} = \frac{-q}{T} = 0$ $[q = 0]$

(B) Heat is supplied from surrounding to system

$\Delta S_{system} > 0$

$\Delta S_{surrounding} < 0$

(C) $\Delta T = 0$

$w = q = 0,$ $\Delta S_{surrounding} = 0$

$\Delta S_{system} = nC_V \ln\frac{T_2}{T_1} + nR\ln\frac{V_2}{V_1}$

$\Delta S_{system} > 0$

(D) heart is supplied

$\Delta S_{surrounding}$ decreases

$\Delta S_{system} > 0$

SECTION – C

1. 3

ratio = $\frac{R^2(a_0)}{R^2(0)}$

$$=\frac{\left(\frac{1}{a_0^3}\right)e^{\frac{-2a_0}{a_0}}}{\left(\frac{1}{a_0^3}\right)e^{0}}=e^{-2}$$

= 3

2. 7

Mole of Ca = $\frac{4}{40}=0.1$

$Ca \to Ca^{+} + e^{-}$

IE required = 0.1 $\times$ 400 = 40 kJ

$\underset{0.1-x}{Ca^{+}} \to \underset{x}{Ca^{+2}} + e^{-}$

$(0.1-x)\times 700 = 10$

$x=\frac{3}{35}$

$Ca^{+}=0.1-\frac{3}{35}=\frac{0.5}{35}$

$Molar\ \ ratio=\frac{\frac{0.5}{35}}{\frac{3}{35}}=\frac{1}{6}=\frac{x}{y}$

$\therefore x+y=7$

3. 0

Benzaldehyde does not reduce Fehling solution.

4. 6

Molecular weight of decapeptide = 796 g/mole

Total bonds to be hydrolysed = (10 – 1) = 9 per molecules

Total weight of H_2O added = 9 $\times$ 18 = 162 g/mol.

Total weight of hydrolysis product = 796 + 162 = 958

Total weight % of glycine = 47%

Total weight of glycine in product $=\frac{958\times 47}{100}\approx 450\,\text{gm}$

Molecular wt of glycine in product = 75 g/mol.

$\therefore$ no. of glycine units = 450/75 = 6.

5. 1

For natural polymers PDI, $\overline{M}_w=\overline{M}_n$

PDI = $\frac{\overline{M}_w}{\overline{M}_n}=1$

Mathematics PART – III

SECTION – A

1. D

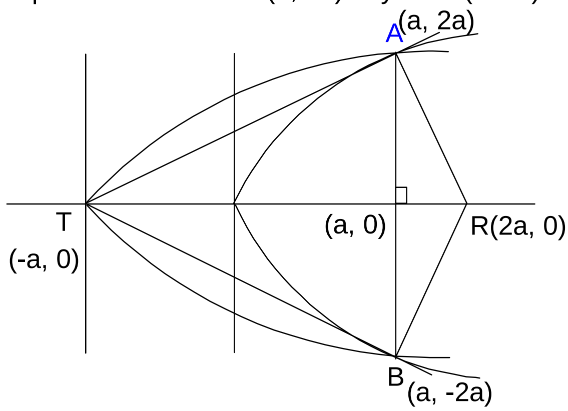
$A \equiv (a, 2a), B \equiv (a, -2a)$

$T \equiv (-a, 0)$

$y^2 = 4b(x + a)$

$\Rightarrow 4a^2 = 8ab \Rightarrow b = \dfrac{a}{2}$

Equation of normal at (a, 2a) to $y^2 = 2a(x + a)$ is $y + 2x = 4a$



$\therefore$ R $\equiv$ (2a, 0)

Area (TARB) = $6a^2$

2. B

Substitute x y = t , and x + y = u

$\dfrac{dt}{du} + t\cot u = t^2 \operatorname{cosec} u$

$xy\sin(x + y + c_1) = c_2$, c_1 and c_2 are related

3. A

K = $4^{10} \Rightarrow$ K = 2^{20}

No. of proper divisors = 19

4. C

P(passing through a_{23}) = $\dfrac{\dfrac{3!}{2!} \times \dfrac{3!}{2!}}{\dfrac{6!}{3!3!}} = \dfrac{9}{20}$

5. C

$\log_{10} x = t$, taking logarithm to base 10 both sides

$t^3 - kt^2 + k - t = 0$

$\Rightarrow t^2(t - k) - (t - k) = 0$

$\Rightarrow (t^2 - 1) = 0$ or $t = k$

$\therefore$ maximum number of three solutions if k $\neq$ - 1, 1

6. A

$f''(x)+f(x)=0$ and $(f'(x))^2+(f(x))^2=1$

$\Rightarrow x=\pm\sin^{-1}(f(x))+c$

$f(0)=1 \Rightarrow f(x)=\cos x$

Equation becomes

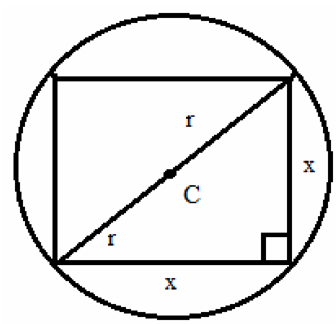
$\sqrt{\sqrt{3}\cos x+\sin x-2}+\sqrt{\cot 3x+\operatorname{cosec}^2 x-4}=\sin\left(\frac{3x}{2}\right)+\frac{\sqrt{2}}{2}$ is satisfied by only $x=\frac{13\pi}{6}$

7. CD

If r be the radius of the circle and if x be the side of the square, then

$x^2+x^2=(2r)^2$

or $x^2=2r^2$



Now, $P_1=\frac{\text{Area of square}}{\text{Area of circle}}=\frac{x^2}{\pi r^2}=\frac{2r^2}{\pi r^2}=\frac{2}{\pi}$

$\therefore P_2=1-P_1=1-\frac{2}{\pi}=\frac{(\pi-2)}{\pi}$

$\therefore\ 2>\pi-2$

$\Rightarrow \frac{2}{\pi}>\frac{\pi-2}{\pi}$

$\Rightarrow P_1>P_2$

Also, $P_1^2+P_2^2=(P_1+P_2)(P_1-P_2)=1\ \frac{(4-\pi)}{\pi}$

$=\frac{4}{\pi}-1<\frac{1}{3}$

$\therefore \left(3<\pi<4 \Rightarrow \frac{3}{\pi}<1<\frac{4}{\pi}\right)$

8. B

$I_{m,n}=\int \sec^{2n}x\tan^m x\,dx=\frac{\sec^{2n-2}x\tan^{m+1}x}{m+1}-(2n-2)\int\frac{\sec^{2n-2}x\tan^{m+2}}{m+1}dx$

$=\frac{\sec^{2n-2}x\tan^{m+1}x}{m+1}-\frac{2(n-1)}{m+1}I_{m+2,\,n-1}$

Similarly

$I_{m,n}=\frac{\sec^{2n}x\tan^{m-1}x}{2n}-\frac{m-1}{2n}I_{m-2,n+1}$

9. ACD

$(\vec{a}.\vec{b})\vec{d}+(\vec{b}.\vec{c})\vec{e}+(\vec{c}.\vec{a})\vec{f}=0$

$\vec{d},\vec{e},\vec{f}$ are linearly independent

$\therefore \vec{a}.\vec{b} = 0; \vec{b}.\vec{c} = 0$ and $\vec{c}.\vec{a} = 0$

$\Rightarrow \vec{a},\vec{b},\vec{c}$ from three mutually perpendicular vectors and are linearly independent vectors.

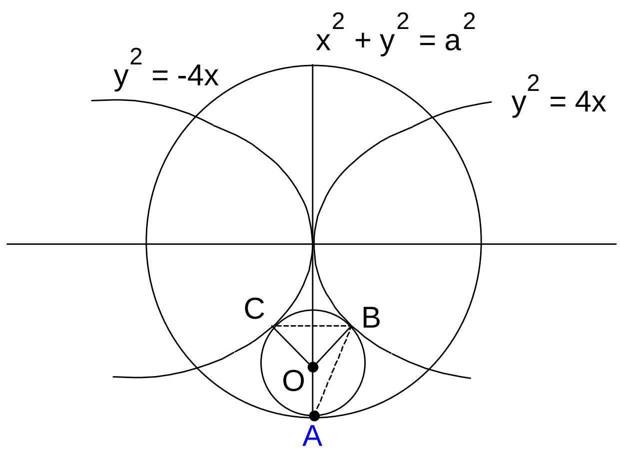
10-11. C – D

Let O be the centre of C_1 m(OB) $\times$ slope (tangent at B) = - 1

$\Rightarrow \frac{1}{\sqrt{3}} \times \frac{2}{y} = -1 \Rightarrow \frac{1}{y} = \frac{-\sqrt{3}}{2} \Rightarrow y = \frac{-2}{\sqrt{3}}$

$x = \frac{1}{3} \Rightarrow B \equiv \left(\frac{1}{3}, \frac{-2}{\sqrt{3}}\right); C \equiv \left(\frac{-1}{3}, \frac{-2}{\sqrt{3}}\right)$

AB = BC = $\frac{2}{3}$



Equation of OB

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

$\therefore O \equiv \left(0, \frac{-7}{3\sqrt{3}}\right)$

Radius of C_1 = $\frac{2}{3\sqrt{3}}$

$\therefore A \equiv \left(0, -\sqrt{3}\right)$

12. C

$f'(x) = 5x^4 + 3px^2 + q = 5x^4 + \sum \alpha_i x^3 + \left(5p + \sum \alpha_i^2\right)x^2 + \left(p\sum \alpha_i + \sum \alpha_i^3\right)x + \left(p\sum \alpha_i^2 + \sum \alpha_i^4 + q\right)$

$\therefore \sum \alpha_i = 0; \sum \alpha_i^2 = -2p$

$p\sum \alpha_i + \sum \alpha_i^3 = 0 \Rightarrow \sum \alpha_i^3 = -p\sum \alpha_i = 0$

13. C

$f'(x) = 3x^2 - 4x + 1 = 3x^2 + \left(\sum \alpha_i - 6\right)x + \left(\sum \alpha_i^2 - 2\sum \alpha_i + 3\right)$

$\Rightarrow \sum \alpha_i = 2; \sum \alpha_i^2 - 2\sum \alpha_i + 3 = 1 \Rightarrow \sum \alpha_i^2 = 2$

As α_i is a root

$$\therefore \alpha_i^3 - 2\alpha_i^2 + \alpha_i - 1 = 0 \Rightarrow \sum \alpha_i^3 - 2\sum \alpha_i^2 + \sum \alpha_i - 3 = 0$$

As α_i is a root $\therefore \Rightarrow \sum \alpha_i^3 = 2\sum \alpha_i^2 - \sum \alpha_i + 3$

$= 5$

14. A

As in Q.13

$\sum \alpha_i^4 - 2\sum \alpha_i^3 + \sum \alpha_i^2 - \sum \alpha_i = 0$

$\Rightarrow \sum \alpha_i^4 = 2 \times 5 - 2 + 2 = 10$

SECTION – B

1. A – rt, B – pq, C – pqs, D – pqrs

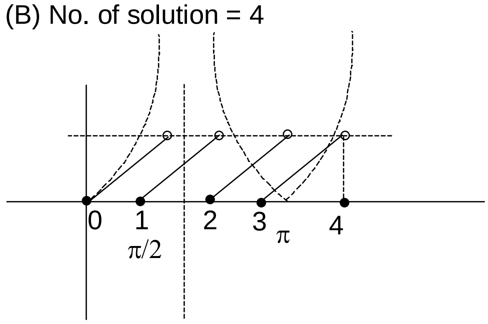
(A) $3^{50} - 7^{20}$

$= (10-1)^{25} - (50-1)^{10}$

$= 10^3 K + 250 - 1 - 112500 + 500 - 1$

Last three digit = 748

(B) No. of solution = 4



(C) $f(x) = \lim_{n \to \infty} \dfrac{\left\{\dfrac{(x-1)(x-3)(x-5)}{3}\right\}^{2n} - 1}{\left\{\dfrac{(x-1)(x-3)(x-5)}{3}\right\}^{2n} + 1}$

$g(x) = \dfrac{(x-1)(x-3)(x-5)}{3}$

$g'(x) = 3x^2 - 15x + 23 = 0$

$\Rightarrow x = \dfrac{18 \pm \sqrt{48}}{6}$

f(x) is discontinuous at six points.

A, B, C, D, E & F

(D) for local minima at x = 0

Kx > 0

$\Rightarrow$ K < 0 as x < 0

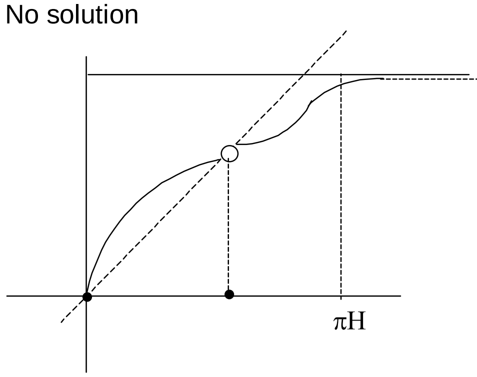
For local minima at x = 4

$\dfrac{K+8}{2} > 0 \Rightarrow K > -8$

Possible $K = \{-7, -6, -5, -4, -2, -1\}$

2. A – rt, B – pq, C – p, D – p

(A) $\{-x\} = 1 - \{x\}$
Let {x} = t
$\Rightarrow 7t^4 + 9t^3(1-t) - 5t^2 + 9t(1-t) - 2 = 0$
$\Rightarrow 2t^4 - 9t^3 + 14t^2 - 9t + 2 = 0$
$t + \frac{1}{t} = 2$ or $t + \frac{1}{t} = \frac{5}{2}$
$t = 1$ or $t = \frac{1}{2}$ or 2
$\therefore \{x\} = \frac{1}{2}$
$x = \frac{1}{2}, \frac{3}{2}, \frac{5}{2}$ etc
(B) $2y^2 + 2xy - 5x = 0$
$\Rightarrow x = \frac{2y^2}{5-2y}$
$x \ge 0 \Rightarrow \frac{2y^2}{5-2y} \ge 0$
$\Rightarrow 5 - 2y > 0$
$\Rightarrow y < \frac{5}{2}$
$\therefore y = 0, 1, 2$
For y = 0, 2, x is positive integer
(C) Not possible such function
(D) solving $f^{-1}(x) = f(x)$ is equivalent to solving y = f(x).
No solution



SECTION – C

1. 7
$1000 = 2^3 \cdot 5^3$, $2000 = 2^4 \cdot 5^3$
so, $a = 2^A \cdot 5^R$, $b = 2^B \cdot 5^S$, $c = 2^C \cdot 5^T$,
max(A, B) = 3, max(A, C) = max(B, C) = 4
max(R, S) = max(R, T) = max(S, T) = 3.
There are 10 ways of choosing R, S, T
1 with all 3, 3 with one 2, 3 with one 1, 3 with one 0, C must be 4. There are 7 ways of choosing A, B;
1 with both 3, 3 with A = 3, B not, 3 with B = 3 and A not
thus 7 ways of choosing A, B, C hence
7 . 10 = 70 ways.

2. 1
Resultant of $z^{2n} + 1$ lies along z^n, if $|z| = 1$
$\therefore$ K = 1

3. 2
The graph of f(x) = y and $y = \left(\frac{1}{e} - e\right)x + \frac{2}{e}$
Two solutions exist.

4. 5
Any point on the line of intersection is (t, -1, 2 – t)
For maximum distance = $\sqrt{(3-t)^2 + 5^2 + (3+t)^2} = \sqrt{43 + 2t^2} \Rightarrow t = 0$
Normal $\vec{n} = (3-0)\hat{i} + (4+1)\hat{j} + (5-2)\hat{k}$
$\therefore$ equation of plane through the line at maximum distance 3x + 5y + 3z = 1

5. 9

$$2\sin^{-1}\alpha + 3\sin^{-1}\beta = \frac{5\pi}{2}$$

$\max.$ of $\sin^{-1}\alpha$ & $\sin^{-1}\beta$ is $\frac{\pi}{2}$

so $\sin^{-1}\alpha = \frac{\pi}{2}$ & $\sin^{-1}\beta = \frac{\pi}{2}$

so $\frac{P}{\pi} = \frac{\left(2\sin^{-1}\alpha \times 3\sin^{-1}\beta\right) \times 2}{\pi}$

$= \frac{12}{\pi} \times \frac{\pi^2}{4} = 3\pi$

so $[3\pi] = 9$