FIITJEE

ALL INDIA TEST SERIES

JEE (Advanced)-2025

FULL TEST – IX

PAPER –2

TEST DATE: 04-05-2025

ANSWERS, HINTS & SOLUTIONS

Physics

PART – I

SECTION – A

1. B

Sol. $a_C = \dfrac{36 - 0.2\times 2g}{10} = 3.2\text{ m/s}^2$

$a_B = \dfrac{0.2\times 2g}{2} = 2\text{ m/s}^2$

$\therefore$ relative acceleration $a_r = 3.2 - 2 = 1.2\text{ m/s}^2$

$\ell_r = \dfrac{1}{2}a_r t_1^2 \Rightarrow t_1 = \sqrt{\dfrac{2}{1.2}}$

For block $v_x = 2t_1$

Also for vertical motion $1 = \dfrac{1}{2}\times 10t_2^2 \Rightarrow t_2 = \sqrt{\dfrac{1}{5}}$

$v_y = 10t_2$, $KE = m(v_x^2 + v_y^2)/2$

2. C

Sol. One component of velocity is along +ve y-axis

So, path will be helical. Path of particle will touch y-axis after every $\dfrac{2\pi m}{qB}$.

3. B

Sol. $mv_0 = (m + m)v$

$v = \dfrac{v_0}{2}$ …(i)

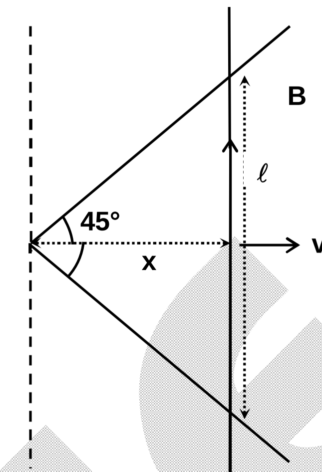
$v = \omega\sqrt{A^2 - x^2}$

$\dfrac{v_0}{2} = \sqrt{\dfrac{k}{2m}}\sqrt{A^2 - \left(\dfrac{mg}{k}\right)^2}$

$A = \sqrt{\dfrac{mv_0^2}{2k} + \dfrac{m^2g^2}{k^2}} = \dfrac{\sqrt{14}}{10}\text{ m}$

4. C

Sol. Induced emf $\varepsilon = B\ell v = 2Bxv$



Induced current $I = \frac{\varepsilon}{R} = \frac{2Bxv}{\lambda 2x(\sqrt{2}+1)}$

Magnetic force on the rod

$$F = -I\ell B = \frac{-2B^2xv}{2\lambda x(\sqrt{2}+1)}2x$$

Acceleration $a = \frac{F}{m} = \frac{-2B^2xv}{\lambda(\sqrt{2}+1)m}$

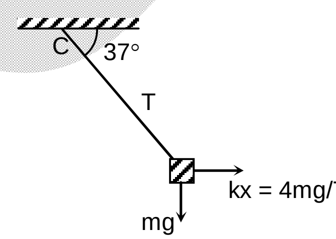
$$\Rightarrow v\frac{dv}{dx} = \frac{-2B^2xv}{\lambda(\sqrt{2}+1)m}$$

$$\Rightarrow \int_{v_0}^{0} dv = -\frac{2B}{m\lambda(\sqrt{2}+1)}\int_0^x xdx$$

$$\Rightarrow x_{max} = \frac{\sqrt{m\lambda v_0(\sqrt{2}+1)}}{B}$$

5. B, C

Sol. Initial tension in spring $kx = \frac{4mg}{7}$



FBD of block just after string is cut
Since, v = 0
$\therefore$ acceleration along string is zero

$T = k\cos 37° + mg\sin 37° = \frac{37}{7}N$

Acceleration is only perpendicular to spring

$ma = mg\cos 37° - kx\sin 37°$

$$\Rightarrow a = \frac{32}{7}\,m/s^2$$

6. A, D

Sol. Charge on capacitor is

$$q = \frac{2CV}{3}\left(1 - e^{-\frac{3t}{2RC}}\right)$$

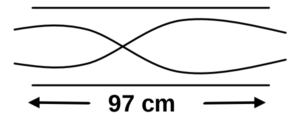
$$V_1 = \frac{2V}{3}\left(1 - e^{-\frac{3t}{2RC}}\right)$$

$$V_2 = V - \frac{2V}{3}\left(1 - e^{-\frac{3t}{2RC}}\right)$$

When, $V_1 = V_2$, $t = \frac{4RC}{3}\ell n2$

7. A, B, C, D

Sol. (A) $\frac{\lambda}{2} = 97 + 0.6D$ ...(i)



$v = f\lambda$

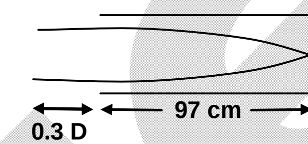
$\lambda = \frac{320}{160} = 2m = 200\,cm$ ...(ii)

From (i) and (ii)

$\frac{200}{2} = 97 + 0.6D$

D = 5 cm

(B) $\frac{\lambda}{4} = 97 + 0.3D$

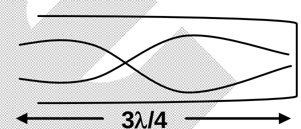


$\lambda = (97 \times 4 + 1.2D)$

$\lambda = (97 \times 4 + 1.2 \times 5) = 394\,cm$

$f = \frac{v}{\lambda} = \frac{32000}{394} = 81.22\,Hz$

(C) $\frac{3\lambda}{4} = 97 + 0.3D$



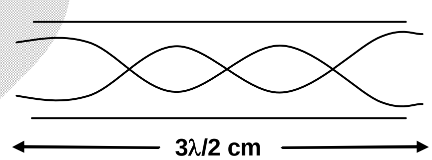
$= 97 + (0.3)(5)$

= 98.5

$\lambda = (98.5)\left(\frac{14}{3}\right) = \frac{394}{3}$

$f = \frac{v}{\lambda} = \frac{32000 \times 3}{394} = 243.65\,Hz$

(D) $\frac{3\lambda}{2} = 97 + 0.6D$

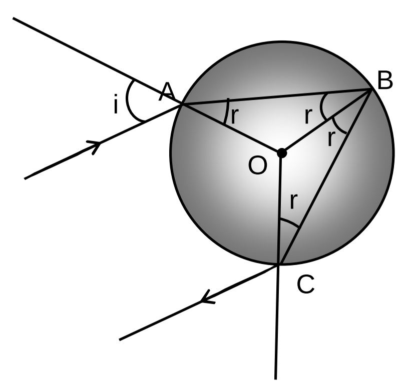


$f = \frac{v}{\lambda} = \frac{320 \times 3 \times 100}{200} = 480$ Hz

SECTION – B

8. 3

Sol. Net deviation



$\delta = (i - r) + (\pi - 2r) + (i - r)$

$= 2(i - r) + (\pi - 2r)$

For minimum deviation $\frac{d\delta}{di} = 0$

$\frac{dr}{di} = \frac{1}{2}$ ...(i)

Snell's law

$\sin i = \mu \sin r$

$\frac{dr}{di} = \frac{\cos i}{\mu \cos r}$ ...(ii)

On solving

$\sin^2 i = \frac{4}{3}\left[1 - \frac{\mu^2}{4}\right]$

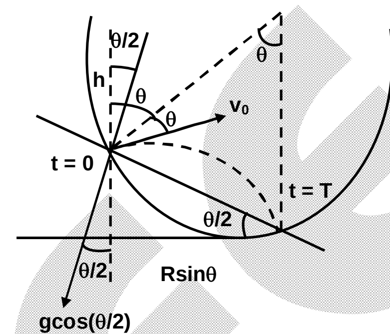
$\sin i = \frac{2}{3}$

9. 2

Sol. $T = 2\pi\sqrt{\frac{L}{g}}$

$T = k\sqrt{\frac{1}{\rho R_e}}$

10. 3



Sol. $T = \frac{2v_0\cos\left(\frac{3\theta}{2}\right)}{g\cos\left(\frac{\theta}{2}\right)}$

$= \frac{2v_0}{g}\left[4\cos^2\left(\frac{\theta}{2}\right) - 3\right]$

Also $R\sin\theta = V_0\sin2\theta T$

$R\sin\theta = \frac{2v_0^2}{g}(2\sin\theta\cos\theta)\left[2(1+\cos\theta) - 3\right]$

As $v_0^2 = 2gh$

$\therefore \quad h = \frac{R}{8\left[\cos\theta\left[2\cos\theta - 1\right]\right]}$

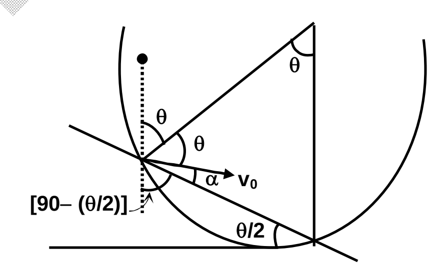
$h \ge 0 \; 2\cos^2\theta - \cos\theta \ge 0$

$\cos\theta(2\cos\theta - 1) \ge 0$

$\cos\theta \ge \frac{1}{2}$

$\theta \le \frac{\pi}{3} \qquad K = 3.$

2^{nd} Method:



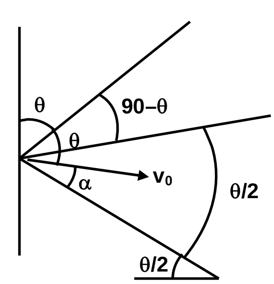
$2\theta + \alpha + \left(90 - \frac{\theta}{2}\right) = 180°$

$\alpha = 90 - \frac{3\theta}{2}$

Now $\alpha > 0$

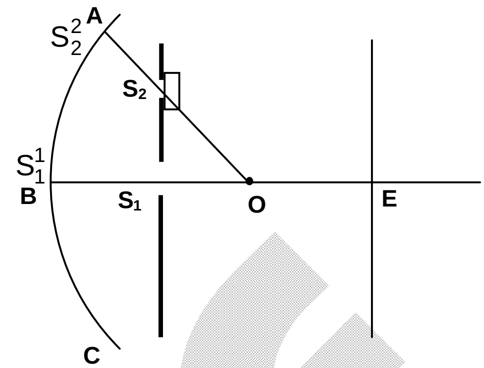
$\theta < 60°$

$\theta_{max} = \frac{\pi}{3}$ radian



11. 8

Sol. Let S_1^1 and S_2^2 are the points on the wave front where perpendiculars can be drawn from S_1 and S_2. For central fringe formed at E path difference should be zero.



$$S_2^2S_2 + (\mu - 1)t + S_2E = S_1^1S_1 + S_1E$$

$$(OS_2^2 - OS_2) + (\mu - 1)t + \sqrt{D^2 + d^2} = (OS_1^1 - OS_1) + D$$

$$(\mu - 1)t = (OS_2 - OS_1) - (\sqrt{D^2 + d^2} - D)$$

using binomial approximation $t = \dfrac{31\lambda}{8}$

12. 4

Sol. $K_{e\,max} = h\nu - \phi = \dfrac{6.6\times10^{-34}\times7.27\times10^{14}}{1.6\times10^{-19}} - 1 = 2\text{ eV}$

Maximum potential difference is 2V

$$U = \frac{1}{2}CV^2$$

13. 9

Sol. If the pressure of the gas is P when the marble is in equilibrium

$PS = P_0S + mg$ …(i)

When the marble is getting at displacement y below the mean position in the tube,

$$dP = -\left(\frac{\gamma P}{V}\right)(-Sy)$$

$$dP = \left(\frac{5}{3}\frac{PS}{V}\right)y$$

$$dP = \frac{5}{3V}(P_0S + mg)y \quad \text{…(ii)}$$

Now, $m\dfrac{d^2y}{dt^2} = -dPS$

$$\frac{d^2y}{dt^2} = \frac{-5S(P_0S + mg)y}{3mV}$$

Time period of oscillations of the marble,

$$T = 2\pi\sqrt{\frac{3mV}{5S(P_0S + mg)}}$$

Hence, k = 9

SECTION – C

14. 21.00

15. 15.00

Sol. (for Q. 14-15):

Charge on plates when k is open

Charge on inner face of plate B = $\dfrac{6}{2}$ = 3 μC and charge on outer surface of plate B = 3 μC.

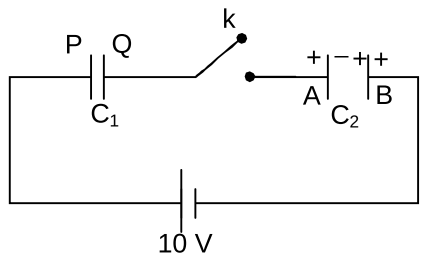


Figure-(1)

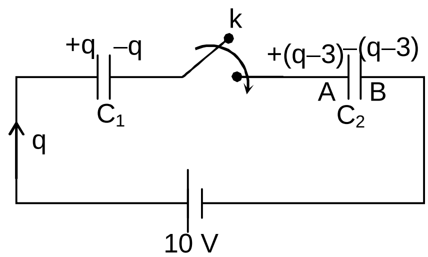


Figure-(2)

For figure (ii)

$10 - \frac{q}{3} - \frac{q-3}{6} = 0$

60 – 2q – q + 3 = 0

q = 21 μC

Charge on plate P = 21 μC

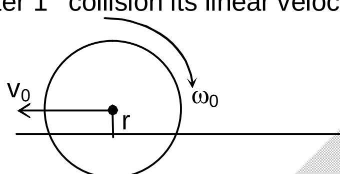
Charge on plate B = [–(21 –3) + 3]μC = –15 μC

16. 8.18

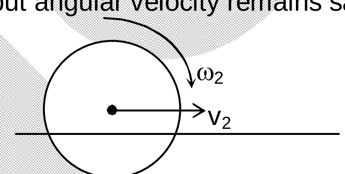
17. 6.69

Sol. (for Q.16-17):

After 1st collision its linear velocity becomes opposite but angular velocity remains same.



Just after collision



When it returns back due to friction

Condition of rolling on rods $v_0 = r\omega_0$

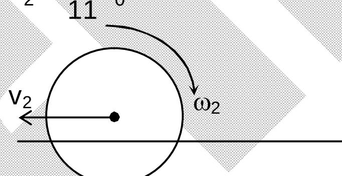
$r = 1 \Rightarrow v_0 = \omega_0$

and $v_2 = \omega_2$

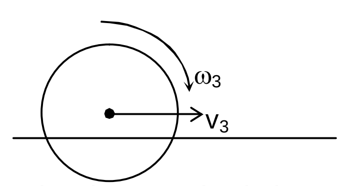
Applying COAM about mid point in the plane of rods

$$-mv_0r + \frac{2}{5}mR^2\omega_0 = mv_2r + \frac{2}{5}mR^2\omega_2$$

$$\Rightarrow v_2 = \frac{9}{11}v_0$$



Just after collision



When it returns back due to friction

Conservation of angular momentum provides

$$v_3 = \frac{9}{11}v_2 = \frac{9}{11}\times\frac{9}{11}v_0$$

By putting the values

$v_2 = 8.18$ m/s

$v_3 = 6.69$ m/s

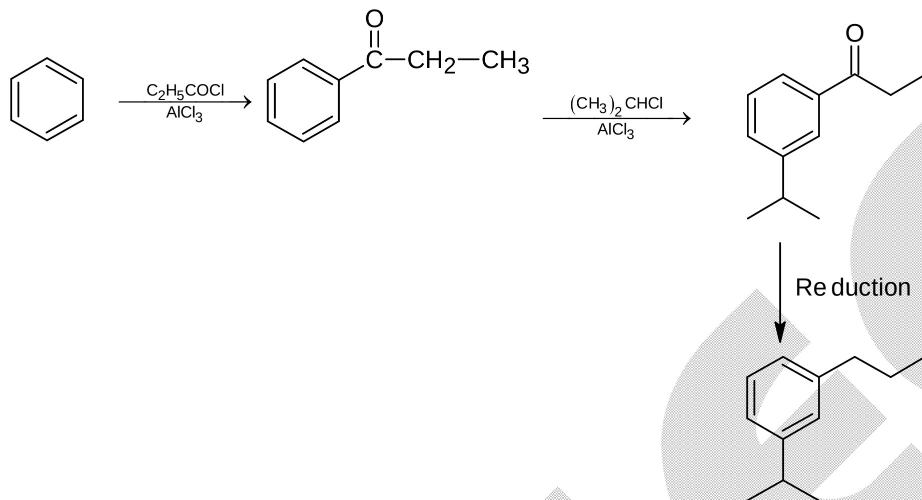
Chemistry

PART – II

SECTION – A

18. D

Sol.



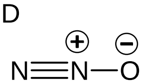
19. B

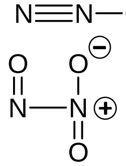
Sol. $-802.8 = 4 \times 416.2 + 2 \times 493.7 - 2 \times \Delta H_{C=O} - 4 \times 464.4$

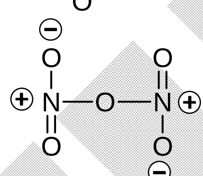
$\Delta H_{C=0} = 798.7 \text{ kJ/mol}$

20. D

Sol.

 $\equiv N_2O$

 $\equiv N_2O_3$

 $\equiv N_2O_5$

21. D

Sol. $CaCO_3(s) \rightleftharpoons CaO(s) + CO_2(g)$

$\qquad\qquad\qquad\qquad\qquad x-y$

$C(s) + CO_2(g) \rightleftharpoons 2CO(g)$

$\qquad\quad x-y \qquad\quad 2y$

$x - y = 4 \times 10^{-2}$

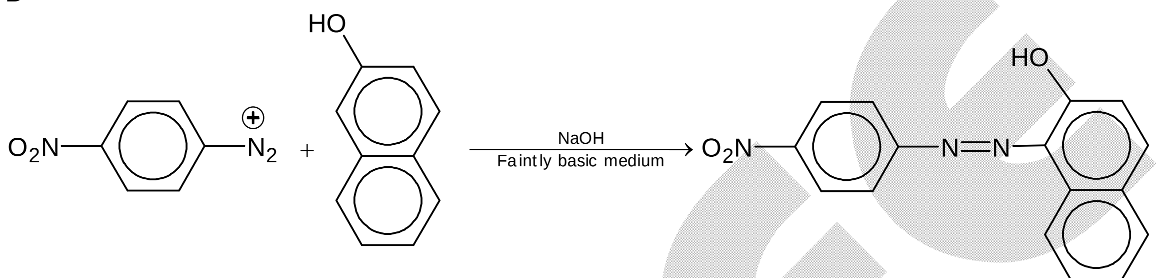
$\frac{(2y)^2}{(x-y)} = 2 \Rightarrow 2y = \sqrt{2(x-y)}$

$= \sqrt{2 \times 4 \times 10^{-2}}$

$= 0.28$

$P_{CO} = 2y = 0.28$

22. B, C
Sol. The V.D. and molar mass of the emergent gas will always be greater than that of pure gas.
- In case of CH_3OH (molar mass 32 g mol^{-1}) and acetone (molar mass 58 g mol^{-1})
- Molar mass of N_2 being 28 g mol^{-1}
- Molar mass of H_2O being 18 g mol^{-1}.
- Molar mass of D_2O being 20 g mol^{-1}.

23. B
Sol.


24. A, B, C
Sol. (A) Below critical micelle concentration soap behaves like normal electrolyte; no micillisation of the anions.
(B) In water-in-oil emulsion, oil forms external (continuous) phase.
(C) $SnO_2 + 2NaOH \longrightarrow Na_2SnO_3 + H_2O$
(D) Cations will be effective in coagulation of negatively charged sol formed in option (C).

SECTION – B

25. 3
Sol. $ZnSO_4 + NaOH(Excess) \longrightarrow Na_2ZnO_2$
$AlCl_3 + NaOH(Excess) \longrightarrow NaAlO_2$
$SnCl_4 + NaOH(Excess) \longrightarrow Na_2SnO_3$

26. 4
Sol. Li, Sr, Ba, Zn

27. 2
Sol. $0.205 = (1+\alpha)0.1 \times 1.86$

$1+\alpha = \frac{2.05}{1.86} = 1.1$

$\alpha = 0.1$

$[H^+] = C\alpha = 0.1 \times 0.1 = 10^{-2}$

pH = 2

28. 3
Sol. $3B_2H_6 + 18CH_3OH \longrightarrow 6B(OCH_3)_3 + 18H_2$

29. 2
Sol. $mvr = \frac{nh}{2\pi}$

$$n = \frac{4.2178 \times 10^{-34} \times 2 \times 3.14}{6.625 \times 10^{-34}} = 4$$

Number of visible line = n – 2
= 4 – 2 = 2

30. 2

Sol. m-methoxy phenol and m-amino phenol.

SECTION – C

31. 44.80

32. 67.20

Sol. (for Q. 31 to 32):

$$(NH_4)_2Cr_2O_7 \xrightarrow{\Delta} N_2 + Cr_2O_3 + 4H_2O$$

$$NH_4NO_3 \xrightarrow{\Delta} N_2O + 2H_2O$$

$$Hg(NO_3)_2 \xrightarrow{\Delta} Hg + 2NO_2 + O_2$$

Total number of moles of diatomic gases (X) $= N_2\,(1\text{ mole}) + O_2\,(1\text{ mole})$
= 2 moles

$\therefore$ Volume $= 2 \times 22.4 = 44.8$ litres

Total number of moles of triatomic gases $= N_2O\,(1\text{ mole}) + NO_2\,(2\text{ moles})$
= 3 moles

$\therefore$ Volume $= 3 \times 22.4 = 67.2$ litres

33. 1.05

34. 3.43
Range (3.42 – 3.43)

Sol. (for Q. 33 to 34)

Let P^o be initial partial pressure of NO.

$2P^o$ be initial partial pressure of NO_2.

$2NO_2$	$\rightleftharpoons$	N_2O_4	$K_{P_1} = 6.8\text{ atm}^{-1}$
$2P^o - 3.4 - P$		1.7	

NO	$+$	NO_2	$\rightleftharpoons$	N_2O_3
$P^o - P$		$2P^o - 3.4 - P$		P

$$K_P\ (\text{for 1st equilibrium})\quad 6.8 = \frac{1.7}{\left(2P^o - 3.4 - P\right)^2}$$

or, $2P^o - 3.4 - P = 0.5$

or, $2P^o - P = 3.9$ .... (1)

Also, total pressure (at equilibrium) $P_{NO_2} + P_{N_2O_4} + P_{NO} + P_{N_2O_3}$

$5.05 = 0.5 + 1.7 + P^o - P + P$

$P^o = 2.85$ atm

Now from Equation (1) $2P^o - P = 3.9$

$2 \times 2.85 - P = 3.9 \quad \Rightarrow P = 1.8$ atm

$\therefore$ Equilibrium pressure of NO $= P^o - P = 2.85 - 1.80$ = 1.05 atm.

$$K_{P_2} = \frac{P_{N_2O_3}}{P_{NO} \times P_{NO_2}} = \frac{1.8}{(1.05)(0.5)} = 3.42\text{ atm}^{-1}.$$

Mathematics

PART – III

SECTION – A

35. C

Sol. Let a, b, c be the intercepts cut off by the plane $\frac{x}{a}+\frac{y}{b}+\frac{z}{c}=1$ or lx + my + nz = p on the coordinate axis

We know $a=\frac{p}{l}, b=\frac{p}{m}, c=\frac{p}{n}$ where p is length of perpendicular from origin to the plane and *l*, m, n are the direction cosines of the normals.

Foot of perpendicular from origin to the plane is $(\alpha, \beta, \gamma) = (pl, pm, pn)$

Now ab + bc + ca = 5

$\Rightarrow p^4\left(\frac{1}{\alpha\beta}+\frac{1}{\beta\gamma}+\frac{1}{\gamma\alpha}\right)=5$

$\Rightarrow \left(\alpha^2+\beta^2+\gamma^2\right)^2\left(\frac{1}{\alpha\beta}+\frac{1}{\beta\gamma}+\frac{1}{\gamma\alpha}\right)=5$

$\Rightarrow$ Locus is $\left(x^2+y^2+z^2\right)^2\left(\frac{1}{xy}+\frac{1}{yz}+\frac{1}{zx}\right)=5$

36. B

Sol. Let F be the fuel charges. Then, $F=\frac{3v^2}{16}$

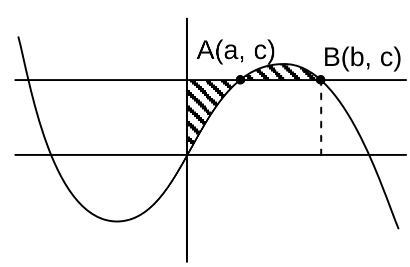
Let train covers λ kms. Then, total cost for running the train, $C=\frac{3v\lambda}{16}+300\times\frac{\lambda}{v}$

For $\frac{dc}{dv}=0$ and $\frac{d^2c}{dv^2}>0$

$\Rightarrow$ v = 40 km/hr

37. B

Sol. Clearly $\int_0^b\left(2x-3x^3\right)dx=\int_0^b c\,dx$ if both areas are equal



Further $b^2-\frac{3}{4}b^4=b\left(2b-3b^3\right)$

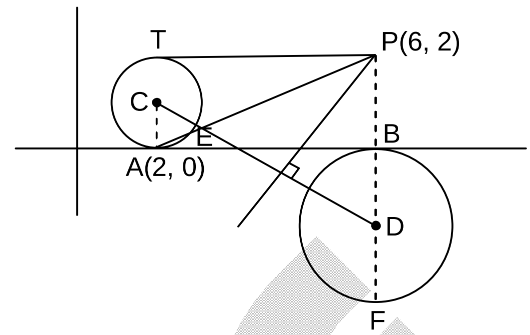
$\Rightarrow b=\frac{2}{3} \Rightarrow c=\frac{4}{9}$

38. D

Sol. Replace x by $-\frac{1}{x}$ required sum is equal to coefficient of x in

$\left(1+x+x^2\right)^{20}\left(1-\frac{1}{x}+\frac{1}{x^2}\right)^{20}$

39. A, C, D
Sol. Clearly P lies on radical axis



$\Rightarrow PE \cdot PA = PB \cdot PF$

$\Rightarrow \frac{PE}{PF} = \frac{PB}{PA} = \frac{2}{2\sqrt{5}} = \frac{1}{\sqrt{5}}$

Again $PE \cdot PA = PT^2$

$\Rightarrow PE = \frac{4^2}{2\sqrt{5}} = \frac{8}{\sqrt{5}}$

40. A, B, C
Sol. $\alpha^{11} = 1 \Rightarrow (\alpha - 1)(\alpha^{10} + \alpha^9 + \alpha^8 + ... + \alpha^2 + \alpha + 1) = 0$ ..... (1)
Now $X = \alpha^6$ is a root of $1 + x + x^2 + ... + x^{10} = 0$
$\Rightarrow 1 + (\lambda + \lambda^2 + \lambda^3 + \lambda^4 + \lambda^5) \cdot 2 = 0$

$\Rightarrow \text{Re}(\lambda + \lambda^2 + ... + \lambda^5) = -\frac{1}{2}$

Now, $\beta, \beta^2, \beta^3, ..., \beta^{10}$ are also roots
Equation (1)
$(x - \beta)(x - \beta^2) ..... (x - \beta^{10}) = 1 + x + x^2 + ... x^{10}$
Now, putting $x = \mu$, we get $(\mu - \beta)(\mu - \beta^2) ..... (\mu - \beta^{10}) = 0$

41. C, D
Sol. $x\,dy + y\,dx + \ln xy(x^2y\,dx + xy^2\,dy) = 0$

$\frac{1}{xy}(xdy + ydx) + \ln(xy)(xdy + ydy) = 0$

$\Rightarrow d(\ln xy) + \frac{1}{2}\ln(xy)d\left(x^2 + y^2\right) = 0$

$\Rightarrow 2\ln|(\ln xy)| + x^2 + y^2 + c = 0$

$\therefore \ln(\ln xy) = -\frac{\left(x^2 + y^2 + c\right)}{2}$

$\ln xy = ce^{-\left(\frac{x^2+y^2}{2}\right)}$

SECTION – B

42. 1
Sol. Here, $\Delta_1 = d(a_1 - a_2)(a_2 - a_3)(a_3 - a_1) = -2d^4$
Also, $\Delta_2 = -2d^4$

43. 7
Sol. We have $f'(x) = f'(3 - x)$ on integrating w.r.t. x
$f(x) = -f(3 - x) + c$
Put $x = 0$
$f(0) + f(3) = c$
$-32 + 46 = c$
$c = 14$

Now let $I = \int_0^3 f(x)dx$ ..... (1)

$I = \int_0^3 f(3-x)\,dx$ ..... (2)

Adding (1) and (2), we get $2I = \int_0^3 \left(f(x) + f(3-x)\right)dx = \int_0^3 14dx = 42$

44. 4

Sol. By differentiating $f_k^n(x)$ we get

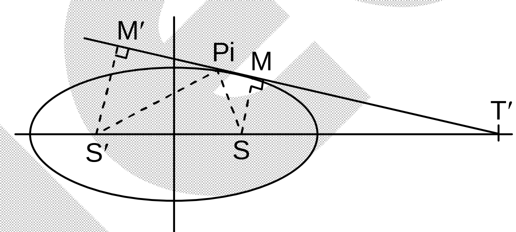
$p_k^{n+1}(x) = (x^k - 1)\frac{d}{dx}p_k^n(x) - (n+1)kx^{k-1}p_k^n(x)$

Substituting x = 1, $p_k^{n+1}(1) = (-k)^n \cdot n!$

Which can be used to obtain $P_k^n(1) = (-k)^n \cdot n!$

So unit digit of $4^4 \cdot 4!$ is 4.

45. 8



Sol. Area of $\Delta P_1ST_1 = \frac{1}{2}P_1T_1 \times SM$

Area of $\Delta P_1T_1S' = \frac{1}{2}P_1T_1 \times S'M'$

$\frac{\text{Area}(\Delta P_1T_1S)\cdot\text{Area}(\Delta P_1T_1S')}{(P_1T_1)^2} = \frac{1}{4}SM\cdot S'M' = \frac{b^2}{4}$

$\sum_{i=1}^{n}\frac{\text{Area}(\Delta PiTiS)\cdot\text{Area}(\Delta PiTiS')}{(PiTi)^2} = \frac{nb^2}{4}$

$\frac{nb^2}{4} = 18 \Rightarrow n = \frac{4\times 18}{9} = 8 \Rightarrow n = 8$

46. 1

Sol. If hyperbola is rectangular, then PS · PS′ = CP^2 = (9 – 2)^2 + (2 + 3)^2 = 49 + 25 = 74

So $\frac{PS\cdot PS'}{74} = 1$

47. 1

Sol. Let t = tan x

$x \to \frac{\pi}{2}^-,\ t \to \infty$

$\lim_{t\to\infty}(1+t)\left\{(1+t)\ln\left(\frac{1+t}{2+t}\right) + 1\right\}$

$\Rightarrow \lim_{t\to\infty}(1+t)\left\{(1+t)\ln\left(1 - \frac{1}{2+t}\right) + 1\right\} = \lim_{t\to\infty}(1+t)\left\{(1+t)\left\{-\frac{1}{2+t} - \frac{1}{\frac{(2+t)^2}{2}} + ...\right\} + 1\right\}$

$= \lim_{t\to\infty}(1+t)\left\{\left\{-\frac{1+t}{2+t} - \frac{(1+t)^2}{(2+t)^2} + ...\right\} + 1\right\} = \lim_{t\to\infty}(1+t)\left\{\left(-1 + \frac{1}{2+t} - \frac{2(1+t)}{(2+t)^2}.....\right) + 1\right\}$

= 1 – 2 = –1

SECTION – C

48. 4.00

Sol. Eigen values are roots of the equation $A - \lambda X = 0 \Rightarrow (A - \lambda I)X = 0$

$\Rightarrow |A - \lambda I| = 0$

$$\Rightarrow \begin{vmatrix} 8-\lambda & -4 \\ 2 & 2-\lambda \end{vmatrix} = 0$$

$\Rightarrow (\lambda - 4)(\lambda - 6) = 0$

$\therefore \lambda = 4, 6$

49. 3.00

Sol. $|A - \lambda I| = 0$

$$\Rightarrow \begin{vmatrix} 1-\lambda & 0 & -1 \\ 1 & 2-\lambda & 1 \\ 2 & 2 & 3-\lambda \end{vmatrix} = 0$$

$\Rightarrow \lambda^3 - 6\lambda^2 + 11\lambda - 6 = 0 \Rightarrow \lambda = 1, 2, 3,$

For $\lambda = 3$

$$X = C\begin{bmatrix} 1 \\ 1 \\ -2 \end{bmatrix} \text{ which is orthogonal}$$

50. 1.00

51. 1.00

Sol. $\because \int_0^{2x} t^2 f(2x-t)\,dt = 2e^{2x} - 4x^2 + 2x - 2$

Using king, we get

$$\Rightarrow \int_0^{2x} (2x-t)^2 f(2x-(2x-t))\,dt = 2e^{2x} - 4x^2 + 2x - 2$$

$$\Rightarrow 4x^2 \cdot \int_0^{2x} f(t)\,dt - 4x \cdot \int_0^{2x} t f(t)\,dt + \int_0^{2x} t^2 f(t)\,dt = 2e^{2x} - 4x^2 + 2x - 2$$

Differentiation with respect to x

$$\Rightarrow 4x^2 f(2x)2 + 8x \cdot \int_0^{2x} f(t)\,dt - 8x^2 f(2x)2 - 4 \cdot \int_0^{2x} t f(t)\,dt + 4x^2 f(2x) \cdot 2 = 4e^{2x} - 8x + 2$$

$$\Rightarrow 8x \cdot \int_0^{2x} f(t)\,dt - 4 \cdot \int_0^{2x} t f(t)\,dt = 4e^{2x} - 8x + 2$$

Again differentiating, we get $8xf(2x) \cdot 2 + 8\int_0^{2x} f(t)\,dt - 8xf(2x) \cdot 2 = 8e^{2x} - 8$

$$\Rightarrow \int_0^{2x} f(t)\,dt = e^{2x} - 1 \Rightarrow f(2x) \cdot 2 = 2e^{2x} \Rightarrow f(2x) = e^{2x}$$

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

$\because g(x) + g'(x) = e^{-x} \Rightarrow \int e^x (g(x) + g'(x))\,dx = \int 1 \cdot dx$

$\Rightarrow e^x g(x) = x + c \because g(1) = \frac{1}{e} \therefore c = 0 \Rightarrow g(x) = xe^{-x}$

$$\therefore \text{Area bounded} = \int_0^{\infty} xe^{-x}\,dx = \left(-xe^{-x}\right)_0^{\infty} + \int_0^{\infty} e^{-x}\,dx = 0 - \left(e^{-x}\right)_0^{\infty} = -(0-1) = 1$$