PEA's

TRIBHUVAN UNIVERSITY

INSTITUTE OF ENGINEERING

B.E. Model Entrance Exam

2080

Date: 2080-2-06

Hints and Solutions

Section – I

1.(c) Average velocity $(v_{av}) = \dfrac{\text{Displacement}}{\text{Time}}$

$= \dfrac{2R}{T} = \dfrac{2\times 40}{40} = 2$ m/s

2.(d) $\dfrac{H_1}{H_2} = \dfrac{\sin^2\theta}{\sin^2(90° - \theta)} = \text{Tan}^2\theta : 1$

3.(b) KE = workdone

or, $40 = F\cos\theta$

or, $\cos\theta = \dfrac{40}{20 \times 4} = \dfrac{1}{2} = \cos 60°$

or, $\theta = 60°$

4.(b) wt = upthrust

or, $m = V_i\rho_l$ ………(1)

For Ice, $m = V\rho_w$ …….(2)

$V_i\rho_l = V\rho_w$

$\rho_l < \rho_w$ so $V_l > V$ i.e. volume immersed is greater then volume water formed by melting ice so level fall.

5.(b) $\dfrac{\Delta l}{l} = \alpha\Delta\theta = 0.1\%$

$\dfrac{\Delta A}{A} = \beta\Delta\theta = 2\ \alpha\Delta\theta = 2 \times 0.1\% = 0.2\%$

6.(d) $P = \sigma 4\pi r^2(T^4 - T_0^4) = ms\dfrac{d\theta}{dt}$

or, $\dfrac{d\theta}{dt} = \dfrac{\sigma 4\pi r^2(T^4 - T_0^4)}{\frac{4\pi}{3}r^3\rho s}$

$= \dfrac{3\sigma(T^4 - T_0^4)}{r\rho s}$

or, $\dfrac{d\theta}{dt} \propto \dfrac{1}{r}$

7.(c) $v = \dfrac{v_{max}}{2}$

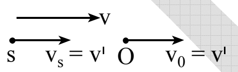
or, $w\sqrt{A^2 - y^2} = \dfrac{Aw}{2}$

or, $A^2 - y^2 = \dfrac{A^2}{4}$

or, $y^2 = \dfrac{3A^2}{4}$

or, $y = \dfrac{\sqrt{3}A}{2}$

8.(c)



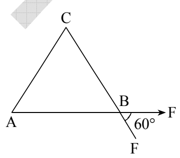
$f' = \dfrac{v - v_0}{v - v_s} \times f = \dfrac{v - v'}{v - v'} \times f = f$

9.(b) At B

$F_R = \sqrt{F^2 + 2F^2\cos 60° + F^2}$

$= \sqrt{2F^2(1 + \cos 60°)}$

$= \sqrt{2F^2 \times \dfrac{3}{2}} = \sqrt{3}F$



10.(d) $W = V_{AB}.q$

$V_{AB} = \dfrac{10}{5} = 2V$

11.(d) $R = \dfrac{\rho l}{A} = \dfrac{\rho l}{\pi r^2}$

$\dfrac{R'}{R} = \dfrac{l'}{l} \times \left(\dfrac{r}{r'}\right)^2 = \dfrac{2l}{l} \times \left(\dfrac{r}{\frac{r}{2}}\right)^2 = 8 \quad R' = 8R$

12.(a) $\dfrac{p'}{p} = \left(\dfrac{v'}{v}\right)^2 = \left(\dfrac{0.6v}{v}\right)^2 = 0.36$

$p' = 0.36 \times 100 = 36W$

13.(d) $T = 2\pi\sqrt{\dfrac{I}{MH}}$

or, $\dfrac{T'}{T} = \sqrt{\dfrac{H}{H'}} = \sqrt{\dfrac{H}{2H'}} = \dfrac{1}{\sqrt{2}}$

$\therefore T' = \dfrac{2}{\sqrt{2}} = \sqrt{2}S$

14.(b) $\beta = \dfrac{D\lambda}{d}$, on decreasing d, β increases

15.(d) $d = t(1 - \dfrac{1}{\mu})$

$\mu = A + \dfrac{B}{\lambda^2}$, $\lambda_r > \lambda_v$ so $\mu_r < \mu_v$

As μ decreases d also decreases so

16.(a) Energy of electrons is independent of intensity.

17.(c) $\beta = \dfrac{I_c}{I_b} = 60$

$A_v = \dfrac{v_{out}}{v_{in}} = \dfrac{I_cR_{out}}{I_bR_{in}} = 60 \times \dfrac{5000}{500} = 600$

18.(d) $AlCl_3$ has a vacant p-orbital so it can accept a pair of electrons. CN^- is ambident nucleophile, NH_3 and H_2O are nucleophile.

19.(a) CH_3COOH-acetic acid, $HCOOCH_3$- methyl methanoate.

20.(a) Fe_2O_3 (Haematite) + 3C → 2Fe + 3CO

21.(b) $PbCl_2$ is insoluble in cold water however soluble in hot water.

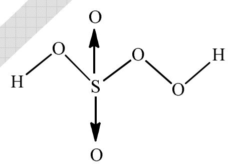
22.(a) $_{25}Mn^{++} = [Ar]3d^5$ i.e. 5 unpaired electrons as-

↑	↑	↑	↑	↑

$_{26}Fe^{++} = [Ar]3d^6$ i.e. 4 unpaired electrons

23.(c) At 300°C, $Na + NH_3 \rightarrow NaNH_2 + H_2$

24.(b)



25.(c) $FeCl_3 + H_2O \rightarrow Fe(OH)_3 + H^+ + Cl^-$

Increase H^+ and decrease the pH

26.(b) Calgon = $Na_2[Na_4(PO_3)_6]$ or $Na_6(PO_3)_6$

27.(d) Since Cu electrode acts as anode and silver electrode acts as cathode.

$Cu/Cu^{2+} = -0.34$ V $\quad \therefore Cu^{2+}/Cu = +0.34$ V

$Ag/Ag^+ = +0.80$ V $\quad \therefore Ag^+/Ag = -0.80$ V

$\therefore$ Ecell = E° cathode – E° anode

$= -0.80 - (+0.34) = -1.14$V

28.(c) 1 gm equivalent (i.e. 29.35 gm) of Nl is deposited by 1 Faraday of electricity.

0.1 F deposits 2.93 gm of Nickel.

29.(c) $A = \begin{pmatrix} 2 & 2 \\ 2 & 7 \end{pmatrix}$

So $A^{-1} = \dfrac{1}{2\times 7 - 2 \times 2}\begin{pmatrix} 7 & -2 \\ -2 & 2 \end{pmatrix} = \begin{pmatrix} 0.7 & -0.2 \\ -0.2 & 0.2 \end{pmatrix}$

30.(b) As the equations have both common roots, we have

$\dfrac{1}{1} = \dfrac{b}{d} = \dfrac{c}{e} \Rightarrow be = cd$

31.(c) $\lim\limits_{x \to 0} \dfrac{\log_a(1+x)}{x} = \lim\limits_{x \to 0} \log_a e . \dfrac{\log_e(1+x)}{x} = \log_a e$

32.(b) $a = 5,\ S_\infty = 15$

or, $\dfrac{a}{1-r} = 15$ or, $\dfrac{5}{1-r} = 15$ or, $1 - r = \dfrac{5}{15}$

$\therefore$ $r = 1 - \dfrac{1}{3} = \dfrac{2}{3}$

33.(b) Here $\int x \operatorname{cosec} x^2 \cot x^2 dx$

Put $y = x^2$ i.e. $\dfrac{dy}{2} \Rightarrow xdx$.

So $\int \operatorname{cosec} y \cot y \dfrac{dy}{2} = -\dfrac{\operatorname{cosec} y}{2} + c = -\dfrac{\operatorname{cosec} x^2}{2} + c$

34.(c) $A \cup B = [-4, 4]$, $A \cap B = (1, 3)$

So, $A \Delta B = (A \cup B) - (A \cap B) = [-4, 4] - (1, 3)$

35.(d) $\left(\dfrac{x}{a}\right)^2 - \left(\dfrac{y}{a}\right)^2 = \sec^2 t - \tan^2 t = 1$

i.e $x^2 - y^2 = a^2$, which is a rectangular hyperbola.

36.(d) Coeff. of $(2r+1)^{th}$ term = coeff. of $(r+2)^{th}$ term

$\Rightarrow$ $C(43, 2r) = C(43, 4 + 1)$

$\Rightarrow$ $2r = r + 1$ or, $2r + 4 + 1 = 43$

$\Rightarrow$ $r = 1$ or, $r = 14$

37.(d) Length of intercepts on intercepts on x-axis $= 2\sqrt{g^2 - c}$

$= 2\sqrt{(-2)^2 - (-12)} = 2\sqrt{4 + 12} = 2.4 = 8$ units

38.(c) $(\vec{a} - \vec{b}) \times (\vec{a} + \vec{b}) = \vec{a} \times \vec{a} + \vec{a} \times \vec{b} - \vec{b} \times \vec{a} + \vec{b} \times \vec{b}$

$= 0 + \vec{a} \times \vec{b} + \vec{a} \times \vec{b} + 0 = 2(\vec{a} \times \vec{b})$

39.(d) $\cos\theta = \sin\alpha$ or, $\cos\theta = \cos\left(\dfrac{\pi}{2} - \alpha\right)$

$\therefore$ $\theta = 2n\pi \pm \left(\dfrac{\pi}{2} - \alpha\right)$

40.(c) Here $f(x) = \cot^{-1}x$. So $f'(x) = -\dfrac{1}{1+x^2} < 0$ for all real x.

41.(b) Here $\alpha = 45°$, $\beta = 60°$, $\gamma = ?$

We have, $\cos^2\alpha + \cos^2\beta + \cos^2\gamma = 1$

or, $\cos^2 45° + \cos^2 60° + \cos^2 r = 1$

or, $\dfrac{1}{2} + \dfrac{1}{4} + \cos^2\gamma = 1$

or, $\cos^2\gamma = \dfrac{1}{4}$ or, $\cos\gamma = \pm\dfrac{1}{2} \Rightarrow r = 60°$ or $120°$

42.(c) Complex number is $-1 - i$.

So $\tan\theta = \dfrac{-1}{-1} = 1 \Rightarrow \theta = 45°$

But $x = -1$, $y = -1$ So, $\theta = 45° + 180° = 225°$

43.(b) We have, $\sin^{-1}x = \cos^{-1}y$

or, $\sin^{-1}x = \sin^{-1}\sqrt{1 - y^2}$

or, $x = \sqrt{1 - y^2}$

or, $x^2 = 1 - y^2$

$\therefore$ $x^2 + y^2 = 1$

44.(d) $\dfrac{d(\sin^{-1}x)^3}{d\sin^{-1}x} = 3(\sin^{-1}x)^2$

45.(c) The bine bisecting the angle between the coordinate axes makes an angle of 45° or 135° with the x-axis. So slope = tan45° or tan135° = ±1

$\therefore$ Eq^n of the line is $y = \pm x$

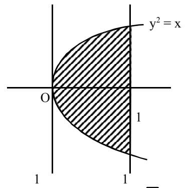
46.(a) Here $f(x) = 10^x + 10^{-x}$

So, $f(-x) = 10^{-x} + 10^x + 10^x = f(x)$.

So f is even

47.(a) Here 2R's are always together, so there are 6 letters in which A is repeated twice. So total no. of arrangements $= \dfrac{6!}{2!} = \dfrac{720}{2} = 360$

48.(d)



Req. Area $= 2\int_0^1 y dx = 2\int_0^1 \sqrt{x}\, dx$

$= 2\left[\dfrac{x^{3/2}}{\frac{3}{2}}\right]_0^1$

$= 2 \times \dfrac{2}{3} = \dfrac{4}{3}$ sq. units

49.(c)	50.(d)	51.(a)	52.(b)	53.(d)	54.(d)
55.(a)	56.(a)	57.(a)	58.(c)	59.(a)	60.(d)

Section – II

61.(b) $a_t = 2 m/s^2$ $a_c = \dfrac{v^2}{r} = \dfrac{30^2}{500} = 1.8 m/s^2$

$a = \sqrt{a_t^2 + a_c^2} = \sqrt{2^2 + 1.8^2} = 2.7 m/s^2$

62.(c) $T_{max} = m(g + a_{max})$

or, $a_{max} = \dfrac{310}{24} - 10 = 2.91 m/s^2$

Again, $h = \dfrac{1}{2} a_{max} t^2$

or, $t = \sqrt{\dfrac{2h}{a_{max}}} = \sqrt{\dfrac{2 \times 4.6}{2.91}} = 1.78$ s

63.(d) First case

$\theta_1 = \dfrac{1}{2}\alpha t^2 = \dfrac{1}{2} \times 0.4 \times 5^2 = 4$ rad.

2nd case

$\theta_2 = \alpha t_1 \times t_2 = 0.4 \times 5 \times 30 = 60$ rad

3rd case

$\theta_3 = 5$ rad

$\therefore$ $\theta = \theta_1 + \theta_2 + \theta_3 = 70$ rad

$\therefore$ $\theta = \dfrac{s}{r}$

$s = \theta r = 70 \times 3 = 210$ m

64.(c) $V = KT^{2/3}$

$\Delta V = \dfrac{2}{3} KT^{-1/3}\, \Delta T$

$\Delta W = P\Delta V = \dfrac{RT \times \Delta V}{V}$

$= \dfrac{RT}{KT^{2/3}} \times \dfrac{2}{3} KT^{-1/3}\, \Delta T$

$= \dfrac{2}{3} R\, \Delta T$

$= \dfrac{2}{3} \times 8.3 \times 30 = 166$ J

65.(a) $\dfrac{P_2}{P_1} = \dfrac{\theta_2 - \theta_0}{\theta_1 - \theta_0}$

or, $\dfrac{P_2}{45} = \dfrac{40 - 20}{80 - 20} = \dfrac{20}{60} = \dfrac{1}{3}$

or, $P_2 = 15$ cal/s

66.(b) $\dfrac{f_2}{f_1} = \sqrt{\dfrac{T_2}{T_1}} = \sqrt{\dfrac{363}{300}} = 1.1$

$\therefore \quad f_2 = 1.1 \times 400 = 440$ Hz

67.(d) $E = -\dfrac{dv}{dx} = -(10x + 10)$

$x = 1$ then $E = -20$V/m

68.(a) Pd between B & D will be zero if

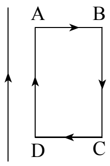
$$\frac{R_{AB}}{R_{BC}} = \frac{R_{AD}}{R_{DC}}$$

or, $\dfrac{12}{0.5} = \dfrac{x+6}{0.5}$

or, $x + 6 = 12$

or, $x = 6\ \Omega$

69.(c) On AD



$F_1 = BI_c l_c$

$= \dfrac{\mu_0 I_1}{2\pi a} \times I_c l_c$

$= \dfrac{4\pi \times 10^{-7} \times 25 \times 15 \times 0.25}{2\pi \times 0.02}$

$= 9.4 \times 10^{-4}$ N toward wire

On BC

$F_2 = BI_c l_c$

$= \dfrac{\mu_0 I_1}{2\pi(a+b)} \times I_c l_c$

$= \dfrac{4\pi \times 10^{-7} \times 25 \times 15 \times 0.25}{2\pi(0.1 + 0.02)}$

$= 1.56 \times 10^{-4}$ N a way from wire

$F = F_1 - F_2 = 7.8 \times 10^{-4}$ N towards

70.(d) $P = I_{rms} V_{rms} \cos\phi$

$= \dfrac{I_0}{\sqrt{2}} \times \dfrac{V_0}{\sqrt{2}} \cos\dfrac{\pi}{2} = 0$

71.(c) $d\sin\theta_1 = \lambda$

or, $\sin\theta_1 = \dfrac{\lambda}{d}$

or, $\theta_1 = \sin^{-1}\left(\dfrac{5000 \times 10^{-10}}{0.001 \times 10^{-3}}\right) = 30°$

72.(a) <u>For end A</u>

$u = v = 2f,\ O = \dfrac{f}{3}$

<u>For end B</u>

$u' = 2f - \dfrac{f}{3} = \dfrac{5f}{3}$

$v' = \dfrac{fu}{u - f} = \dfrac{f \times \frac{5f}{3}}{\frac{5f}{3} - f}$

$= \dfrac{5f^2}{3} \times \dfrac{3}{2f} = 2.5\ f$

Length of image (I) = $v' - v$

$= 2.5f - 2f = 0.5f$

$m = \dfrac{I}{0} = \dfrac{0.5f}{\frac{f}{3}} = 1.5$

73.(a) $\dfrac{N}{N_0} = \left(\dfrac{1}{2}\right)^{\frac{t}{T_{1/2}}}$

$= \left(\dfrac{1}{2}\right)^{\frac{20}{5}} = \dfrac{1}{16}$

Decayed $= 1 - \dfrac{N}{N_0} = \dfrac{15}{16} \times 100\%$

$= 93.75\%$

74.(c) Work done = E_i

or, E.e.s = E_i

or, $\dfrac{V}{d}\,es = 15.6 \times 1.6 \times 10^{-19}$

or, $V = \dfrac{15.6 \times 0.013}{4 \times 10^{-5}} = 5070$ V

75.(d) 0.3 $MHNO_3$ = 0.3 N HNO_3

0.3 M H_2SO_4 = 0.6 N H_2SO_4

or, $N_1V_1 + N_2V_2 = N_3V_3$

or, $0.3 \times 100 + 0.6 \times 200 = N_3 \times 300 \Rightarrow N_3 = 0.5$

76.(c) $Ux/Uy = \sqrt{\dfrac{3RT}{Mx}} / \sqrt{\dfrac{3RT}{My}} = \sqrt{\dfrac{My}{Mx}} \Rightarrow \dfrac{My}{Mx} = 1/9$

77.(c) $Kb = \dfrac{m \text{ x } W \text{ x } \Delta T}{w \text{ x } 1000}$ where, m → molecular wt. of solute.

$= \dfrac{180 \text{ x } 100 \text{ x } 0.1}{1.8 \text{ x } 1000} = 1$ k/moL

78.(b) With $KMnO_4/OH^-$(Baeyer's reagent), ethyne gives oxalic acid and ethene gives glycol.

79.(b) One electron is shifted from 3d to 4p – orbital.

80.(c) Cl_2 + concNaOH → NaCl + $NaClO_3$
(hot)

81.(a) Thermal stability of alkaline earth metals increases down the group.

82.(c) As $3 - \sin 2x \neq 0$, So domain = $\Re$. Also $-1 \leq \sin x \leq 1$

So range $= \left[\dfrac{1}{3-(-1)}, \dfrac{1}{3-1}\right] = \left[\dfrac{1}{4}, \dfrac{1}{2}\right]$

83.(c) Put $y = \cos^{-1}x$ i.e. $x = \cos y$

$\therefore \quad dy = -\dfrac{1}{\sqrt{1-x^2}}\,dx$

Then $I = -\int y\cos y\,dy$

$= -\left[y\int\cos y\,dy - \int\left(\dfrac{dy}{dx}\int\cos y\,dy\right)dy\right]$

$= -[y\sin y - \int\sin y\,dy]$

$= -[y\sin y + \cos y] + c$

$= -\cos y - y\sqrt{1-\cos^2 y} + c$

$= -x - \cos^{-1}x\sqrt{1-x^2} + c$

84.(a) Here $x = \sin t$, $\quad y = \sin pt$

So, $\dfrac{dx}{dt} = \cos t$, $\quad \dfrac{dy}{dt} = p\cos pt$

Then $\dfrac{dy}{dx} = \dfrac{\frac{dy}{dt}}{\frac{dx}{dt}} = \dfrac{p\cos pt}{\cos t}$

Also, $\dfrac{d^2y}{dx^2} = \dfrac{d}{dx}\left(\dfrac{dy}{dx}\right) = \dfrac{d}{dt}\left(\dfrac{p\cos pt}{\cos t}\right)\dfrac{dt}{dx}$

$= p\left[\dfrac{\cos t\,(-p\sin pt) - (-\sin t)\cos pt}{\cos^2 t}\right] \cdot \dfrac{1}{\cos t}$

or, $\cos^2 t\,\dfrac{d^2y}{dx^2} = p\left[-p\sin pt + \sin t\,\dfrac{\cos pt}{\cos t}\right]$

or, $\cos^2 t\,\dfrac{d^2y}{dx^2} = -p^2\sin pt + \sin t\left(\dfrac{p\cos pt}{\cos t}\right)$

or, $(1 - \sin^2 t)\dfrac{d^2y}{dx^2} = -p^2\sin pt + \sin t\,\dfrac{dy}{dx}$

i.e. $(1 - x^2)\dfrac{d^2y}{dx^2} - x\dfrac{dy}{dx} + p^2y = 0$

85.(a) $\tan^{-1}x + \tan^{-1}y = \dfrac{\pi}{4}$

or, $\tan^{-1}\dfrac{x+y}{1-xy} = \dfrac{\pi}{4}$

or, $\dfrac{x + y}{1 - xy} = \tan\dfrac{\pi}{4}$

or, $x + y = 1 - xy$

i.e. $x + y + xy = 1$

86.(d) $1 + \sin x + \sin^2 x + \ldots \text{ to } \infty = 4 + 2\sqrt{3}$

or, $\dfrac{1}{1 - \sin x} = 4 + 2\sqrt{3}$

or, $1 - \sin x = \dfrac{1}{4 + 2\sqrt{3}}$

or, $\sin x = 1 - \dfrac{4 - 2\sqrt{3}}{16 - 12} = 1 - \dfrac{4 - 2\sqrt{3}}{4} = \dfrac{2\sqrt{3}}{4} = \dfrac{\sqrt{3}}{2}$

$\therefore$ $x = 60°$ or, $120°$

87.(b) Let z_1, z_2, z_3 be three complex numbers in AP so $2z_2 = z_1 + z_3$

$\Rightarrow$ z_2 is midpoint of line joining z_1 and z_3. So they lie on a straight line.

88.(c) Given eq^n is: $x^2 + px + q = 0$

Let α and β be the roots.

Then $\alpha + \beta = -p$, $\alpha\beta = q$

Given $\alpha + \beta = 3(\alpha - \beta)$ $\Rightarrow \alpha - \beta = -\dfrac{p}{3}$

So, $(\alpha - \beta)^2 = \left(-\dfrac{p}{3}\right)^2$

or, $(\alpha + \beta)^2 - 4\alpha\beta = \dfrac{p^2}{9}$

or, $p^2 - 4q = \dfrac{p^2}{9}$ or, $\dfrac{8p^2}{9} = 4q \Rightarrow 2p^2 = 9q$

89.(b) $1.1! + 2.2! + \ldots + n.n!$

$= \sum\limits_{k=1}^{n} k.k! = \sum\limits_{k=1}^{n} (k + 1 - r)\,k!$

$= \sum\limits_{k=1}^{n} [(k + 1)\,k! - k!]$

$= \sum\limits_{k=1}^{n} [k + 1)! - k!]$

$= (n + 1)! - 1$

90.(d) $\vec{a} + \vec{b} - \vec{c} = 0$, $|\vec{a}| = |\vec{b}| = |\vec{c}| = 1$

or, $\vec{a} + \vec{b} = \vec{c}$

or, $(\vec{a} + \vec{b}) = \vec{c}^2$

or, $|\vec{a}|^2 + |\vec{b}|^2 + 2\vec{a}.\vec{b} = |\vec{c}|^2$

or, $1 + 1 + 2|\vec{a}|\,|\vec{b}| \cos\theta = 1$

or, $2.1.1 \cos\theta = -1$

or, $\cos\theta = -\dfrac{1}{2}$ $\Rightarrow \theta = \dfrac{2\pi}{3}$

91.(d) Here $\dfrac{e^{7x} + e^{x}}{e^{3x}} = e^{4x} + e^{-2x}$

$= \sum\limits_{n=0}^{\infty} \dfrac{4^n x^n}{n!} + \sum\limits_{n=0}^{\infty} \dfrac{(-2)^n x^n}{n!}$

$\therefore$ Coeff. of $x^n = \dfrac{4^n}{n!} + \dfrac{(-2)^n}{n!} = \dfrac{4^n + (-2)^n}{n!}$

92.(c) Given $m_2 = 5m_1 \Rightarrow m_1 + 5m_1 = -\dfrac{2h}{b}$

$\Rightarrow$ $m_1 = -\dfrac{2h}{6b}$ and $m_1.5m_1 = \dfrac{a}{b} \Rightarrow 5.\left(-\dfrac{2h}{6b}\right)^2 = \dfrac{a}{b}$

$\Rightarrow$ $5.\dfrac{4h^2}{36b^2} = \dfrac{a}{b}$ $\Rightarrow$ $5h^2 = 9ab$

93.(a) As the parabola pases through the point $(-2, 1)$ we have, $1^2 = 4.p.(-2) \Rightarrow 4p = -\dfrac{1}{2}$

$\therefore$ Length of latus rectum $= \dfrac{1}{2}$

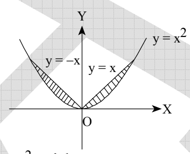
94.(b) For a line equally inclined to the coordinate axes, $\alpha = \beta = \gamma$

So, $\cos^2\alpha + \cos^2\alpha + \cos^2\alpha = 1 \Rightarrow \cos\alpha = \pm\dfrac{1}{\sqrt{3}}$

$\therefore$ dc's are $\pm\dfrac{1}{\sqrt{3}}, \pm\dfrac{1}{\sqrt{3}}, \pm\dfrac{1}{\sqrt{3}}$

The possible combinations is 8 but 4 of them are opposite of other 4.

95.(b)



Solving $y = x^2$ with $y = x$,

$x^2 = x \Rightarrow x = 0, 1$

$\therefore$ Required area $= 2.\int_0^1 (x - x^2)dx$

$= 2\left[\dfrac{x^2}{2} - \dfrac{x^3}{3}\right]_0^1 = 2\left[\dfrac{1}{2} - \dfrac{1}{3}\right]$

$= 2.\dfrac{1}{6} = \dfrac{1}{3}$ sq. units

96.(c) Given $A + B = \dfrac{\pi}{2}$ $\Rightarrow B = \dfrac{\pi}{2} - A$

Let $P = \cos A \cos B = \cos A \cos\left(\dfrac{\pi}{2} - A\right) = \cos A \sin A$

$= \dfrac{1}{2}\sin 2A$

Then $\dfrac{dP}{dA} = \cos 2A$, $\dfrac{d^2p}{dA^2} = -2\sin 2A$

For maxima or minima, $\dfrac{dp}{dA} = 0 \Rightarrow \cos 2A = 0$

$\Rightarrow 2A = \dfrac{\pi}{2} \Rightarrow A = \dfrac{\pi}{4}$

At $A = \dfrac{\pi}{4}$, $\dfrac{d^2P}{dA^2} = -2 < 0$

$\therefore$ Max. of $P = \dfrac{1}{2}\sin 2.\dfrac{\pi}{4} = \dfrac{1}{2}$

97.(d) 98.(a) 99.(b) 100.(b)

…The End…