MAJOR TEST # 01 | **DATE : 07 - 03 - 2013**

SYLLABUS : SECTION – 1

ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	3	4	2	3	1	3	2	1	4	3	1	3	4	2	4	4	2	1	3	4
Que.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Ans.	3	4	2	4	1	2	1	4	3	1	1	2	2	4	4	3	3	3	1	1
Que.	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	2	2	1	3	2	2	3	4	4	2	3	1	4	1	2	2	1	2	4	3
Que.	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
Ans.	1	2	1	2	1	2	3	1	2	1	2	3	1	4	1	1	2	3	4	1
Que.	81	82	83	84	85	86	87	88	89	90										
Ans.	2	1	2	1	3	2	2	3	2	4										

HINT – SHEET

31. $E^{\circ}_{cell} = \frac{0.0591}{2}\log 10^{12}$

$= \frac{0.0591}{2} \times 12 \log 12$

$= 0.354$ volt

33. NCERT XII part 1 ; Page No. 71

$Mg_{(s)} \longrightarrow Mg^{+2} + 2e^-$ (at anode)

$2Ag^+ + 2e^- \longrightarrow 2Ag(s)$ (at cathode)

$Mg_{(s)} + 2Ag^+ \longrightarrow M_g^{+2} + 2Ag(s)$

$$Q = \frac{[Mg^{+2}]}{[Ag^+]^2} = \frac{0.1}{(0.001)^2} = \frac{10^{-1}}{(10^{-3})^2} = \frac{10^{-1}}{10^{-6}} = 10^5$$

$$E_{cell} = E^{\circ}_{cell} - \frac{0.06}{2}\log_{10}^{10^5}$$

$$E_{cell} = 3.17 - \frac{0.06}{2} \times 5\log_{10}10 = 3.17 - 0.03\times5$$

$= 3.17 - 0.15$

$= 3.02$ V

34. $\wedge_{eq} = \frac{\kappa\times1000}{\text{Normality}} = \frac{\kappa\times1000}{0.1}$

$\wedge eq = \kappa\times10000$

35. $\frac{W_1}{E_1} = \frac{W_2}{E_2}$

$\frac{W_{0_2}}{E_{o_2}} = \frac{W_{Ag}}{E_{Ag}}$

$\frac{1.6}{8} = \frac{W_{Ag}}{108} \Rightarrow W_{Ay} = 0.2 \times 108$

$= 21.6$ gm

36. In Al_2O_3, Aluminium is in highest oxidation state of + 3, hence it can not undergo further oxidation.

37. C.N. of Cr = $2 \times 3 = 6$

$3 \times 1 + x + 3(-2) = 0$

$x - 3 = 0$

$[x = +3]$

38. Let the oxidation number of oxygen is x

$+3 + 2x + 0 \times 4 + 0 - 2 = 0$

$2x + 1 = 0 \Rightarrow 2x = -1\ [x = -1/2]$

Thus, oxygen will be in superoxoform

39. $N_1V_1 + N_2V_2 + N_3V_3 = N(V_1 + V_2 + V_3)$

$12 \times 1 + 6 \times 2 + 2 \times 6 = N(9)$

$N = 4$

40. $V = \dfrac{\text{mass}}{d} = \dfrac{205.5}{0.79} = 260.13 \text{ ml}$

$$M = \frac{w \times 1000}{m_B \times v} = \frac{5.5 \times 1000}{36.5 \times 206.13}$$

42. $H^+ = C\alpha$ $\qquad$ $C = 0.1$ M

$10^{-2} = 0.1\alpha$ $\qquad$ $H^+ = 10^{-2}$

$\alpha = 0.1$ $\qquad$ $i = 1 + \alpha(N-1) = 1 + 0.1(2-1) = 1.1$

$\pi = CRTi$

$= 0.1 \times RT \times 1.1 = 0.11\ RT$

45. $E_a = 2/3\ [E_{a_1} + E_{a_2} - E_{a_3}]$

$E_a = 2/3\ [180 + 80 - 50]$

$E_a = 140$

46. $K = \dfrac{2.303}{t}\log\dfrac{C_0}{C_t}$

$$2.303 = \frac{2.303}{1}\log\frac{C_0}{C_t}$$

$$\frac{C_0}{C_t} = 10$$

$C_t = 0.1$

Rate = $K\,[C_t]$

$= 2.303 \times 0.1 = 0.2303$ M min^{-1}

47. $t_1 = \dfrac{2.303 \times (t_1/2)_1}{0.693}, \log\left(\dfrac{1}{1-1/4}\right)$

$$t_2 = \frac{2.303 \times (t_1/2)_2}{0.693} \times \log\frac{1}{(1-3/4)}$$

$$\frac{t_1}{t_2} = \frac{8}{1} \times \frac{\log 4/3}{\log 4}$$

$$\frac{t_1}{t_2} = \frac{1}{0.602}$$

48. $K_{sp} = [Pb^{+2}]\ [SO_4^{-2}]$

$1.8 \times 10^{-8} = [Pb^{+2}]\ (0.0045)$

$Pb^{+2} = 4 \times 10^{-6}$

50. $CH_3COOH + H_2O \rightleftharpoons CH_3COO^- + H_3O^+$

$CH_3COONa \rightarrow CH_3COO^- + Na^+$

backward reaction $H^+ \downarrow$ pH $\uparrow$

57. $T = \dfrac{\Delta H^\circ}{\Delta S^\circ} = \dfrac{30.96 \times 1000}{90} = 344K$

60. $\Delta E = nC_VdT$

$= 1 \times 2.5\ (100 - 300)$

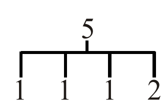
$= -500$ J/mol

61.

Matrix A	Matrix B
1 × 32	40 × 1
32 × 1	1 × 40
2 × 16	20 × 2
16 × 2	2 × 20
4 × 8	8 × 5
8 × 4	4 × 10
	10 × 4
	5 × 8

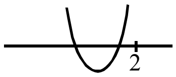
$$\frac{4}{6 \times 8} = \frac{1}{12}$$

62.



$$\frac{\dfrac{\lfloor 5}{\lfloor 1\,\lfloor 1\,\lfloor 1\,\lfloor 2\,\lfloor 3}.\lfloor 4}{4^5} = \frac{15}{64}$$

67. (Interval of a for which roots of equation are real) – (Interval of value of a for which both roots of the equation are less then 2)



$D \ge 0$;	$-\dfrac{b}{2a} < 2$;	$f(2) > 0$
$(a-3)^2 - 4a \ge 0$	$\dfrac{(a-3)}{2} < 2$	$4 - 2(a-3) + a > 0$
$a^2 - 10a + 9 \ge 0$	$\boxed{a < 7}$	$10 - a > 0$
$(a-1)(a-9) \ge 0$		$\boxed{a < 10}$

$\boxed{a \le 1 \text{ or } a \ge 9}$

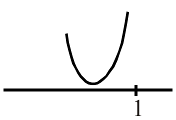
Common part $a \in (-\infty, 1]$

required solution $a \in (-\infty, 1] \cup [9, \infty) - (-\infty, 1]$

req. solution $[9, \infty)$

68. $f(x) = ax^2 + x + c - a = 0$

$f(l) = a + 1 + c - a = c + 1 > 0 \quad \because c > -1$



$f\left(\dfrac{1}{2}\right) > 0$

$$\frac{9}{4} + \frac{1}{2} + c - a > 0$$

$4c - 3a + 2 > 0$

$4c + 2 > 3a$

70. $x^2(x_1 + x_2) - 4x\, x_1x_2 + x_1x_2(x_1 + x_2) = 0$

$D = 16\, x_1^2x_2^2 - 4x_1x_2(x_1 + x_2)$

$D > 0$

So roots are real

and product of roots of the equation is negative

$$= \frac{x_1x_2(x_1 + x_2)}{(x_1 + x_2)}$$

b'coz $\quad x_1x_2 < 0$

so roots are real and opposite in sign.

72. $x^2 - 3x + 1 = 0$

$x + \dfrac{1}{x} = 3; \quad x^2 + \dfrac{1}{x^2} = 7; \quad x^4 + \dfrac{1}{x^4} = 47$

$x^9 + x^7 + x^{-9} + x^{-7} \qquad x^8 + \dfrac{1}{x^8} = 2207$

$$x^8\left(x + \frac{1}{x}\right) + x^{-8}\left(x + \frac{1}{x}\right)$$

$$\left(x + \frac{1}{x}\right)\left(x^8 + \frac{1}{x^8}\right) = 3 \times 2207 = 6621$$

73. $$y = \frac{3x^2 + mx + n}{x^2 + 1}$$

$x^2(y - 3) - mx + (y - n) = 0$

$\Delta \ge 0$

$m^2 - 4(y - 3)(y - n) \ge 0$

$m^2 - 4y^2 + 4(n + 3)\, y - 12n \ge 0 \quad \ldots(1)$

$4y^2 - 4(n + 3)y + 12n - m^2 \le 0$

But $\quad -4 \le y < 3$

So $\quad (y + 4)(y - 3) \le 0$

$\quad y^2 + y - 12 \le 0 \quad \ldots(2)$

equation (1) and equation (2) should be similar so

$$\frac{4}{1} = \frac{-4(n+3)}{1} = \frac{-(12n - m^2)}{12}$$

$-n - 3 = 1$

$n = -4; \quad m = 0 \quad |m + n| = 4$

74. ${}^{100}C_{50}\, P^{50}\, q^{50} = {}^{100}C_{51}\, P^{51}\, q^{49}$

(where $q = 1 - P$)

$$\frac{q}{P} = \frac{{}^{100}C_{51}}{{}^{100}C_{50}}$$

$$\frac{1-P}{P} = \frac{100 - 51 + 1}{51}; \quad \frac{1-P}{P} = \frac{50}{51} \Rightarrow P = \frac{51}{101}$$

75. $\boxed{7}\,\Box\,\Box\,\Box\,\Box$

1 9 9 9 9 $= 9^4 \quad \therefore$ if 7 fill in first place

$\Box\,\Box\,\Box\,\Box\,\Box$

8 9 9 9 4 $= 32 \times 9^3$ if 7 can be fill in any last 4 places

$9^4 + (32 \times 9^3) = 41 \times 9^3$

76. $\underset{2}{\overset{a}{\square}}\ \underbrace{\overset{b}{\square}\ \overset{c}{\square}}_{6}\ \underset{2}{\overset{d}{\square}}$ $\left\{\begin{array}{l}\text{for bc}\\ \\ 34, 35, 36, 45, 46, 56\end{array}\right.$

$= 24$

79. a, A_1, A_2, b are in A.P.

then $A_1 + A_2 = a + b$ ......(1)

a, G_1, G_2, b are in G.P.

$G_1 G_2 = ab$ .....(2)

a, H_1, H_2, b are in H.P.

$\Rightarrow \frac{1}{H_1}+\frac{1}{H_2}=\frac{1}{a}+\frac{1}{b} = \frac{a+b}{ab}=\frac{A_1+A_2}{G_1G_2}$

80. $\because \frac{a+b+c}{3} \geq (abc)^{1/3}$

$\frac{2b+b}{3} \geq (64)^{1/3}$ ($\because$ a, b, c are in A.P.)

$\Rightarrow b \geq 4$

Minimum value of b is 4.

82. $(1+x+y+z)^4 \longrightarrow$ coefficient of x^2y, xy^2z, xyz

$({}^4c_1\,{}^3c_2\,{}^1c_1)$, $({}^4c_1\,{}^3c_2\,{}^1c_1)$, $({}^4c_1\,{}^3c_1\,{}^2c_1\,{}^1c_1)$

12 : 12 : 24

1 : 1 : 2

83. $\left(3^{\frac{2}{4}}+2^{\frac{3}{6}}\right)^{500} = \left(3^{\frac{1}{2}}+2^{\frac{1}{2}}\right)^{500}$

$\left[\frac{500}{2}\right]+1 = 251$

84. $(1 - x + x^2)^n = a_0 + a_1x + a_2x^2 + ...a_{2n}x^{2n}$...(1)

put x = 1, –1 in eq^n. (1) and add.

$a_0 + a_2 + ... = \frac{3^n+1}{2}$

85. $r=\frac{3}{\frac{1}{3}+\frac{1}{6}}=6$

$T_{r+1} = T_{6+1} = {}^9c_6\, a^3b^6 = 84a^3b^6$

A > G

$\frac{a^3+b^6}{2} \geq \sqrt{a^3b^6}$

$1 \geq a^3b^6 \Rightarrow a^3b^6 \leq 1$

So $84a^3b^6 \leq 84$

86. From the system of equations

$d_1 = d_2 = d_3 = 0 \Rightarrow D_1 = D_2 = D_3 = 0$

$$D = \begin{vmatrix}(a-1) & -1 & -1\\ 1 & -(b-1) & 1\\ 1 & 1 & -(c-1)\end{vmatrix} = 0$$

$\Rightarrow abc - ab - bc - ca = 0$

$\Rightarrow ab + bc + ca = abc$

87. $\because 0 \leq [x] < 2 \Rightarrow [x] = 0 , 1$

$-1 \leq [y] < 1 \Rightarrow [y] = -1, 0$

$1 \leq [z] < 3 \Rightarrow [z] = 1 ; 2$

Now apply $R_2 \to R_2 - R_1$, $R_3 \to R_3 - R_1$

$$\begin{vmatrix}[x]+1 & [y] & [z]\\ -1 & 1 & 0\\ -1 & 0 & 1\end{vmatrix} = [x] + [y] + [z] + 1$$

$= 1 + 0 + 2 + 1 = 4$ (Max. value)

88. Multiplying both sides by x then

$$\begin{vmatrix}x^2 & 2x & x^2\\ x^2 & x & 6\\ x & x & 6\end{vmatrix} = Ax^5 + Bx^4 + Cx^3 + Dx^2 + Ex$$

Differentiating both sides w.r.t. x and the putting x = 1

$$\begin{vmatrix}2 & 2 & 2\\ 1 & 1 & 6\\ 1 & 1 & 6\end{vmatrix} + \begin{vmatrix}1 & 2 & 1\\ 2 & 1 & 0\\ 1 & 1 & 6\end{vmatrix} + \begin{vmatrix}1 & 2 & 1\\ 1 & 1 & 6\\ 1 & 1 & 0\end{vmatrix}$$

$= 5A + 4B + 3C + 2D + E = -11.$

89. By the properties option (2) is correct.

90. $I = \begin{pmatrix}1 & 0\\ 0 & 1\end{pmatrix}$, $B = \begin{pmatrix}0 & 0\\ 1 & 0\end{pmatrix}$

$(I + B)^{50} = {}^{50}C_0 I^{50}B^0 + {}^{50}C_1 I^{49}B^1 + {}^{50}C_2 I^{48}B^2 + ...$

$...... + {}^{50}C_{50} I^0 B^{50}$

= I + 50 IB + Zero Matrix + Zero Matrix + ...

$\left\{\because B^2 = \begin{pmatrix}0 & 0\\ 1 & 0\end{pmatrix} = \begin{pmatrix}0 & 0\\ 1 & 0\end{pmatrix} = \begin{pmatrix}0 & 0\\ 0 & 0\end{pmatrix}\right\}$

= I + 50B

$= \begin{pmatrix}1 & 0\\ 0 & 1\end{pmatrix} + \begin{pmatrix}0 & 0\\ 50 & 0\end{pmatrix} = \begin{pmatrix}1 & 0\\ 50 & 1\end{pmatrix}$