Sri Chaitanya IIT Academy, India

A.P, TELANGANA, KARNATAKA, TAMILNADU, MAHARASHTRA, DELHI, RANCHI

A right Choice for the Real Aspirant

ICON CENTRAL OFFICE, MADHAPUR-HYD

Sec: Sr. IPLCO Date: 26-09-15

Time: 9:00 AM to 12:00 Noon RPTM-8 Max.Marks: 360

KEY SHEET

CHEMISTRY		PHYSICS		MATHS	
Q.NO	ANSWER	Q.NO	ANSWER	Q.NO	ANSWER
1	4	31	3	61	1
2	3	32	2	62	1
3	4	33	2	63	1
4	2	34	3	64	3
5	2	35	3	65	2
6	1	36	2	66	3
7	4	37	2	67	1
8	3	38	4	68	4
9	1	39	3	69	1
10	4	40	4	70	1
11	3	41	3	71	4
12	4	42	2	72	3
13	2	43	3	73	4
14	3	44	4	74	3
15	4	45	3	75	3
16	4	46	3	76	4
17	3	47	1	77	3
18	4	48	1	78	1
19	3	49	2	79	4
20	4	50	1	80	2
21	2	51	3	81	2
22	2	52	4	82	3
23	3	53	2	83	2
24	1	54	2	84	4
25	4	55	3	85	4
26	4	56	3	86	3
27	2	57	1	87	3
28	1	58	3	88	1
29	2	59	4	89	3
30	3	60	2	90	1

MATHS

61. From the graph observe that there are 8 solutions.

62. $\det\left(adj(adjA)\right)=\left(\det A\right)^{(n-1)^2}$

63. conceptual

64. $\begin{vmatrix} x & 3 & 2 \\ 1 & y & 4 \\ 2 & 2 & z \end{vmatrix}$

$xyz=60$

$8x+4y+3z=20$

$=x(yz-8)-3(z-8)+2(2-2y)$

$=60-(8x+4y+3z)+28$

$=40+28$

$=68$

$\therefore A(adjA)=(\det A)I$

65. $AB=-BA\Rightarrow\left(A+B\right)^2=A^2+B^2$

66. $\alpha+\beta+\gamma=0$

67. $\begin{vmatrix} 4 & \left(e^{i\alpha}-e^{-i\alpha}\right)^2 & 4 \\ 4 & \left(e^{i\beta}-e^{-i\beta}\right)^2 & 4 \\ 4 & \left(e^{i\gamma}-e^{-i\gamma}\right)^2 & 4 \end{vmatrix} R_1\to R_1-R_2$

68. $\sum_{n=1}^{N}u_n=\begin{vmatrix} \dfrac{N(N+1)}{2} & 1 & 5 \\ \dfrac{N(N+1)(2N+1)}{26} & 2N+1 & 2N+1 \\ \dfrac{N^2(N+1)}{4} & 3N^2 & 3N \end{vmatrix}$

69. by $R_1\to R_1-R_2$

70. $|A-\lambda I|=0 \Rightarrow \lambda_1+\lambda_2+\lambda_3=2$, $\lambda_1\lambda_2\lambda_3=22$ and there will be infinite number of X satisfy is $AX=\lambda_1 X$ for any particular $\lambda=\lambda_1$

71. $$\Delta=\begin{vmatrix}1 & \alpha & \beta\\ 1 & \alpha & \beta\\ 1 & \alpha^2 & \beta^2\end{vmatrix}^2=(a+b+c)^2\left(b^2-4ac\right)^2$$

72. $AA^T=I \Rightarrow a^2+b^2+c^2=1$; $ab+bc+ca=0$ then use these equations to prove the truth of (3)

73. The determinant is constant then $\frac{d}{dx}(A)=0$

74. $$\begin{vmatrix}5 & 4 & 3\\ x51 & y41 & z31\\ x & y & z\end{vmatrix}=\begin{vmatrix}5 & 4 & 3\\ 100x & 100y & 100z\\ x & y & z\end{vmatrix}+\begin{vmatrix}5 & 4 & 3\\ 50 & 40 & 30\\ x & y & z\end{vmatrix}+\begin{vmatrix}5 & 4 & 3\\ 1 & 1 & 1\\ x & y & z\end{vmatrix}=0$$

$$\Rightarrow\begin{vmatrix}5 & 4 & 3\\ 1 & 1 & 1\\ x & y & z\end{vmatrix}=0$$

$\Rightarrow$ x,y,z are in A.P

75. $P^2=BI-P$

$P^3=P(I-P)=P(I-P)\Rightarrow P^3=2P-I$

$P^4=5P-3I$ and $P^6=5I-8P\Rightarrow n=6$

76. $|Adj\ A|=A^5, \left|Adj|A|\ A\right|=\left||A|\ A\right|^5=|A|^{30}.|A|^5$

$\Rightarrow \left|Adj|A|\ A\right|=|A|^{35}$

Now $\Rightarrow \left||A|\,Adj\left(|A|\ A\right)\right|=|A|^6\left|Adj\left(|A|\ A\right)\right|=|A|^6.|A|^{35}=|A|^{41}$

77. $$\left|(2A)^{-1}\right|=\frac{Adj(2A)}{|2A|}=\frac{Adj\ A}{14}\Rightarrow\left|(2A)^{-1}\right|=\frac{1}{14^3}|Adj\ A|=\frac{1}{56}$$

78. Taking x common from C_2,x+1 from C_3 and x-1 from R_3,we get

$$\Delta(x)=x(x+1)(x-1)\begin{vmatrix}1 & 1 & 1\\ 2x & x-1 & x\\ 3x & x-2 & x\end{vmatrix}$$

Applying $C_1 \to C_1 - C_3, C_2 \to C_2 - C_3$, we get

$$\Delta(x) = x(x+1)(x-1)\begin{vmatrix} 0 & 0 & 1 \\ x & -1 & x \\ 2x & -2 & x \end{vmatrix} = 0 \left[\because C_1 \text{ and } C_2 \text{ are proportional}\right]$$

Thus, $\Delta(100) = 0$

79. $|Q| = \begin{vmatrix} 2^2 a_{11} & 2^3 a_{12} & 2^4 a_{13} \\ 2^3 a_{21} & 2^4 a_{22} & 2^5 a_{23} \\ 2^4 a_{31} & 2^5 a_{32} & 2^6 a_{33} \end{vmatrix}$

$$= (2^2)(2^3)(2^4)\begin{vmatrix} a_{11} & a_{12} & a_{13} \\ 2a_{21} & 2a_{22} & 2a_{23} \\ 2^2 a_{31} & 2^2 a_{32} & 2^2 a_{33} \end{vmatrix}$$

$$= 2^9(2)(2^2)\begin{vmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{vmatrix} = 2^{12}|P| = 2^{13}$$

80. On expansion observe that the det. Is independent of p.

81. $C_3 \to C_3 + C_1 + C_2$, gives $\Delta = (2 + 4\sin\theta)\begin{vmatrix} 1+\sin^2\theta & \cos^2\theta & 1 \\ \sin^2\theta & 1+\cos^2\theta & 1 \\ \sin^2\theta & \cos^2\theta & 1 \end{vmatrix}$

Applying $R_3 \to R_3 - R_2, R_2 \to R_2 - R_1$, we get

$$\Delta = 2(1 + 2\sin 4\theta)\begin{vmatrix} 1+\sin^2\theta & \cos^2\theta & 1 \\ -1 & 1 & 0 \\ 0 & -1 & 0 \end{vmatrix} = 2(1 + 2\sin 4\theta)$$

$$\Delta = 0 \Rightarrow \sin 4\theta = -1/2$$

Now, $0 \le \theta \le \frac{\pi}{2} \Rightarrow 0 \le 4\theta \le 2\pi$

$$4\theta = \frac{7\pi}{6}, \frac{11\pi}{6} \Rightarrow \theta = \frac{7\pi}{24}, \frac{11\pi}{24}$$

82. Assume $X = \begin{pmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{pmatrix}$ and solve the problem

$$\begin{pmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 3 & 2 & 1 \end{pmatrix}\begin{pmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{pmatrix} = \begin{pmatrix} 1 & 2 & 3 \\ 0 & 3 & 3 \\ 0 & 0 & 1 \end{pmatrix}$$

83. Divide LHS by λ^4 and C_1 by λ_2, C_2 by λ, C_3 by λ on RHS and then take limit as $\alpha \to \infty$

84. $\Delta_1 = \begin{vmatrix} x^2 & -2x & 1 \\ y^2 & -2y & 1 \\ z^2 & -2z & 1 \end{vmatrix} \begin{vmatrix} 1 & a & a^2 \\ 2 & b & b^2 \\ 1 & c & c^2 \end{vmatrix}$ by Row – row product Now-use Row-row product after $C_1 \leftrightarrow C_3$ we get $\Delta_2 \quad \Delta_1 = \Delta_2$

85. As the system has a non-zero solution $\Delta = \begin{vmatrix} p & b & c \\ a & q & c \\ a & b & r \end{vmatrix} = 0$ apply $R_2 \to R_2 - R_1, R_3 \to R_3 - R_1$

$$\Delta = \begin{vmatrix} p & b & c \\ a-p & q-b & 0 \\ a-p & 0 & r-c \end{vmatrix} = 0$$

Expanding along R_3,we get

$$-(a-p)(q-b)c + (r-c)\left[q(q-b) - b(a-b)\right] = 0$$

Dividing $(p-a)(q-b)(r-c)$,we get

$$\frac{c}{r-c} + \frac{p}{p-a} + \frac{b}{q-b} = 0$$

$$\Rightarrow \frac{c-r}{r-c} + \frac{r}{r-c} + \frac{p}{p-a} + \frac{b-q}{q-b} + \frac{q}{q-b} = 0$$

$$\Rightarrow \frac{p}{p-a} + \frac{q}{q-b} + \frac{r}{r-c} = 2$$

86. $\Delta^2 = \begin{vmatrix} l_1 & m_1 & n_1 \\ l_2 & m_2 & n_2 \\ l_3 & m_3 & n_3 \end{vmatrix} . \begin{vmatrix} l_1 & l_2 & l_3 \\ m_1 & m_2 & m_3 \\ n_1 & n_2 & n_3 \end{vmatrix}$

$$\Delta^2 = \begin{vmatrix} l_1^2 + m_1^2 + n_1^2 & l_1 l_2 + m_1 m_2 + n_1 n_2 & l_1 l_3 + m_1 m_3 + n_1 n_3 \\ l_2 l_1 + m_2 m_1 + n_2 n_1 & l_2^2 + m_2^2 + n_2^2 & l_2 l_3 + m_2 m_3 + n_2 n_3 \\ l_3 l_1 + m_3 m_1 + n_3 n_1 & l_3 l_2 + m_3 m_2 + n_3 n_2 & l_3^2 + m_3^2 + n_3^2 \end{vmatrix}$$

$$\Delta^2 = \begin{vmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{vmatrix} = 1(1) = 1 \Rightarrow |\Delta| = 1$$

87. $(16x+2)x^2 + rx + 3k - 1 = 0$

$(12k+4)x^2 + px + 6k - 2 = 0$

$$\frac{6k+2}{12k+4}=\frac{r}{p}=\frac{3k-1}{6k-2}\Rightarrow\frac{r}{p}=\frac{1}{2}$$

$2r-p=0$

88. $I-A=\begin{bmatrix}1 & \tan(\alpha/2)\\ -\tan(\alpha/2) & 1\end{bmatrix}$, then $(I-A)^{-1}=\frac{1}{\sec^2(\alpha/2)}\begin{bmatrix}1 & \tan(\alpha/2)\\ -\tan(\alpha/2) & 1\end{bmatrix}$

Now, $(I+A)(I-A)^{-1}=\frac{1}{\sec^2(\alpha/2)}\begin{bmatrix}1 & -\tan(\alpha/2)\\ \tan(\alpha/2) & 1\end{bmatrix}\begin{bmatrix}1 & -\tan(\alpha/2)\\ \tan(\alpha/2) & 1\end{bmatrix}$

$$\begin{bmatrix}\frac{1-\tan^2(\alpha/2)}{1+\tan^2(\alpha/2)} & \frac{-2\tan(\alpha/2)}{1+\tan^2(\alpha/2)}\\ \frac{2\tan(\alpha/2)}{1+\tan^2(\alpha/2)} & \frac{1-\tan^2(\alpha/2)}{1+\tan^2(\alpha/2)}\end{bmatrix}=\begin{bmatrix}\cos\alpha & -\sin\alpha\\ \sin\alpha & \cos\alpha\end{bmatrix}$$

89. Let $M=\begin{bmatrix}a_1 & b_1 & c_1\\ a_2 & b_2 & c_2\\ a_3 & b_3 & c_3\end{bmatrix}$

$$\begin{bmatrix}a_1 & b_1 & c_1\\ a_2 & b_2 & c_2\\ a_3 & b_3 & c_3\end{bmatrix}\begin{bmatrix}0\\1\\0\end{bmatrix}=\begin{bmatrix}-1\\2\\3\end{bmatrix}$$

$b_1=-1, b_2=2, b_3=3$

$$\begin{bmatrix}a_1 & b_1 & c_1\\ a_2 & b_2 & c_2\\ a_3 & b_3 & c_3\end{bmatrix}\begin{bmatrix}1\\-1\\0\end{bmatrix}=\begin{bmatrix}1\\1\\-1\end{bmatrix}$$

$a_1-b_1=1, a_2-b_2=1, a_3-b_3=-1$

$a_1=0, a_2=3, a_3=2$

$$\begin{bmatrix}a_1 & b_1 & c_1\\ a_2 & b_2 & c_2\\ a_3 & b_3 & c_3\end{bmatrix}\begin{bmatrix}1\\1\\1\end{bmatrix}=\begin{bmatrix}1\\0\\12\end{bmatrix}$$

$a_1+b_1+c_1=1, a_2+b_2+c_2=0, a_3+b_3+c_3=12$

$c_1=2, c_2=-5, c_3=7$

$$M = \begin{bmatrix} 0 & -1 & 2 \\ 3 & 2 & -5 \\ 2 & 3 & 7 \end{bmatrix}$$

90. $\frac{p}{2}+\frac{q}{2}=\frac{\pi}{4} \Rightarrow \frac{\tan p/2+\tan q/2}{1-\tan p/2.\tan q/2}=1 \to -\frac{b}{a}=1-\frac{c}{a}$

$c=a+b$