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 | JEE–ADVANCE | Date: 01-11-15
Time: 3 Hours | 2014-P2-Model | Max Marks: 180

PAPER-II
KEY & SOLUTIONS

PHYSICS

1	**C**	2	**B**	3	**C**	4	**B**	5	**B**	6	**B**
7	**B**	8	**B**	9	**B**	10	**A**	11	**A**	12	**C**
13	**A**	14	**A**	15	**A**	16	**B**	17	**A**	18	**C**
19	**B**	20	**D**								

CHEMISTRY

21	**C**	22	**A**	23	**D**	24	**C**	25	**D**	26	**B**
27	**C**	28	**B**	29	**D**	30	**A**	31	**B**	32	**C**
33	**B**	34	**D**	35	**D**	36	**D**	37	**A**	38	**B**
39	**D**	40	**A**								

MATHS

41	**A**	42	**B**	43	**D**	44	**A**	45	**A**	46	**C**
47	**D**	48	**C**	49	**C**	50	**C**	51	**B**	52	**D**
53	**D**	54	**C**	55	**A**	56	**C**	57	**A**	58	**A**
59	**A**	60	**A**								

MATHS

41. $\begin{vmatrix} 3 & 1 & 2 \\ 2 & 1 & -1 \\ 5 & 3 & 0 \end{vmatrix} = 5(-3)-3(-5)=0 \Rightarrow \bar{a},\bar{b},\bar{c}$ coplanar

Maximum value

$$=\left|\bar{a}\times\bar{b}\right|+\left|\bar{b}\times\bar{c}\right|=\left\|\begin{bmatrix} \bar{i} & \bar{j} & \bar{k} \\ 1 & 1 & 2 \\ 2 & 1 & -1 \end{bmatrix}\right\|+\left\|\begin{bmatrix} \bar{i} & \bar{j} & \bar{k} \\ 2 & 1 & -1 \\ 5 & 3 & 0 \end{bmatrix}\right\|=\sqrt{9+25+1}+\sqrt{9+25+1}=2\sqrt{35}$$

45. $\begin{vmatrix} -1 & c & b \\ c & -1 & a \\ b & a & -1 \end{vmatrix}=0 \Rightarrow a^2+b^2+c^2-2abc=1$

$\Rightarrow (b+ca)^2 = 1-a^2-c^2+c^2a^2 = (1-a^2)(1-c^2)$

Now $a^2 \le 1 \Rightarrow c^2 \le 1$ satisfying $b^2 \le 1$

$(G.E)_{\max} - \left(\sqrt{1+1+1}\right)^2 = 3$

46. Let $(\bar{a},\bar{c})=\theta,(\bar{b},\bar{c})=\theta$

$\bar{a}+\bar{b}=\bar{c} \Rightarrow \bar{a}.\bar{a}+\bar{a}.\bar{b}=\bar{a}.\bar{c} \Rightarrow 6+4\cos 3\theta = c\cos\theta$

$\bar{b}.\bar{a}+\bar{b}.\bar{b}=\bar{b}.\bar{c} \Rightarrow 6\cos 3\theta + 4 = c\cos 2\theta$

Now, $(6+4\cos 3\theta)\cos 2\theta = (6\cos 3\theta + 4)\cos\theta$

$\Rightarrow 4(4\cos 3\theta\cos 2\theta - \cos\theta) = 6(\cos 3\theta - \cos 2\theta)$

$\Rightarrow 2\{\cos 3\theta\cos 2\theta - \cos(3\theta - 2\theta)\} = 3\{\cos 3\theta\cos\theta - \cos\theta - \cos(3\theta-\theta)\}$

$\Rightarrow 2\sin\theta = 3\sin\theta \Rightarrow \cos\theta = \frac{3}{4}$

$\Rightarrow c = \frac{6+4\cos 3\theta}{\cos\theta} = \frac{8}{3}(3+2\cos 3\theta) = \frac{8}{3}\left[3+2\times\left(\frac{-15}{16}\right)\right] = 5$

47. $\bar{r}\times\bar{a}+(\bar{r}.\bar{b})\bar{c}=\bar{d}$

$\Rightarrow (\bar{r}\times\bar{a})\times\bar{c} = \bar{d}\times\bar{c} \Rightarrow (\bar{r}.\bar{c})\bar{a} - (\bar{a}.\bar{c})\bar{r} = \bar{d}\times\bar{c}$

Now $\bar{a}\times\{\bar{r}\times\bar{a}\} = \bar{a}\times\frac{\bar{a}(\bar{d}\times\bar{c})}{\bar{a}.\bar{c}} \Rightarrow (\bar{a}.\bar{a})\bar{r} - (\bar{a}.\bar{r})\bar{a} = \bar{a}\times\frac{\bar{a}(\bar{d}\times\bar{c})}{\bar{a}.\bar{c}}$

$$\Rightarrow \bar{r} = \frac{(\bar{a}.\bar{r})\bar{a}}{|\bar{a}|^2} + \bar{a} \times \frac{\bar{a} \times (\bar{d} \times \bar{c})}{(\bar{a}.\bar{c})|\bar{a}|^2} \Rightarrow \lambda = \frac{\bar{r}.\bar{a}}{|\bar{a}|^2}$$

48. $(3x+y-1)+\lambda(z-4)=0$ $\quad \begin{vmatrix} 1 & 1 & 1 \\ 0 & 1 & 2 \\ \hline 1-2 & 1 & \end{vmatrix} \frac{x+2}{1} = \frac{y-1}{-2} = \frac{z-0}{1}$

$\therefore (3,1,\lambda).(1,-2,1)=0 \Rightarrow 3-2+\lambda=0 \Rightarrow \lambda=-1 \Rightarrow$ plane is $3x+y-z+3=0$

Now $\left.\begin{matrix} \alpha=-1 \\ \beta=-3 \\ \gamma=3 \end{matrix}\right\} \alpha^2+\beta^2+\gamma^2=19$

49. $V=\frac{1}{6}dab\sin\theta=\frac{1}{6}(8)(12)(6)\frac{1}{2}=48$

51&52. $L_1=\frac{x}{0}=\frac{y-b}{-b}=\frac{z}{c}, L_2=\frac{x-a}{a}=\frac{y}{0}=\frac{z}{c}$

Equation of plane P is $\begin{vmatrix} x & y-b & 3 \\ 0 & -b & c \\ a & 0 & c \end{vmatrix}=0$

$\Rightarrow -bc(x)+ac(y-b)+ab(z)=0 \Rightarrow \frac{x}{a}-\frac{y}{b}-\frac{z}{c}+1=0$

$$S.D = \frac{\begin{vmatrix} -a & b & 0 \\ 0 & -b & c \\ a & 0 & c \end{vmatrix}}{\sqrt{(bc)^2+(ca)^2+(ab)^2}} = \frac{1}{4} \Rightarrow \frac{1}{a^2}+\frac{1}{b^2}+\frac{1}{c^2}=64$$

Required distance $=\frac{1}{\sqrt{64}}=\frac{1}{8}$

53&54. L_1, L_2 interset : $A(0,0,0)$

L_1, L_3 interset : $B(1,1,1)$

L_2, L_3 interset : $C(\alpha,\beta,\gamma)=(\lambda,2\lambda,3\lambda)$

$$\Rightarrow \begin{vmatrix} 1 & 1 & 1 \\ 1 & 2 & 3 \\ a & b & c \end{vmatrix} = 0 \Rightarrow a - 2b + c = 0$$

Area $= \sqrt{6} \Rightarrow \frac{1}{2}\left|\left(\lambda, 2\lambda, 3\lambda\right) \times \left(1,1,1\right)\right| = \sqrt{6} \Rightarrow \lambda\sqrt{1+4+1} = 2\sqrt{6} \Rightarrow \lambda = 2$

$\therefore c = \left(2,4,6\right) \Rightarrow \alpha + \beta + \gamma = 12$

$L_2 : Drs : 1,2,3$

$L_3 : Drs : 2-1, 4-1, 6-1 \Rightarrow 1,3,5$

$$\cos\theta = \frac{1+6+15}{\sqrt{14}\sqrt{35}} = \frac{22}{\sqrt{14}\sqrt{35}} = \frac{11\times 2}{7\sqrt{10}} = \frac{22}{7\sqrt{10}}$$

55&56

$$\begin{vmatrix} i & j & k \\ 2 & -3 & 4 \\ 1 & -2 & 3 \end{vmatrix} = \left(-1,-2,-1\right)$$

$$\begin{vmatrix} i & j & k \\ -1 & -2 & -1 \\ 1 & -2 & 3 \end{vmatrix} = \left(4,-1,-2\right) \Rightarrow d.cs = \frac{4}{\sqrt{21}}, \frac{-1}{\sqrt{21}}, \frac{-2}{\sqrt{21}}$$

The point on the line $\frac{x}{3} = \frac{y}{-1} = \frac{z}{1}$ at a distance $2\sqrt{11}$ units from the origin is given by

$$\frac{x}{\left(\frac{3}{\sqrt{11}}\right)} = \frac{y}{\left(\frac{-1}{\sqrt{11}}\right)} = \frac{z}{\frac{1}{\sqrt{11}}} = 2\sqrt{11} \Rightarrow \left.\begin{matrix} x = 6 \\ y = -2 \\ z = 2 \end{matrix}\right\} \left(6,2,-2\right)$$