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 ADVANCED	DATE : 06-12-15
TIME : 3:00	2013_P1 MODEL	MAX MARKS : 180

KEY & SOLUTIONS

PHYSICS

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

CHEMISTRY

21	D	22	C	23	A	24	A	25	B	26	A
27	D	28	C	29	B	30	B	31	AB	32	ABC
33	D	34	BD	35	C	36	4	37	3	38	1
39	5	40	2								

MATHEMATICS

41	C	42	C	43	A	44	A	45	A	46	B
47	A	48	B	49	B	50	D	51	AD	52	ABC
53	C	54	AB	55	AB	56	3	57	4	58	3
59	1	60	8								

MATHS

41. $t^4-2\left(1+t^2\right)+a^2-6=0 \Rightarrow \left(t^2-1\right)^2=9-a^2$

$\therefore 9-a^2 \geq 0 \Rightarrow |a| \leq 3 \Rightarrow a \in [-3,3]$ $No.of$ $\text{int}\,egers=7$

42. by eliminating "x" we have $2a^3+c=3a(1+b) \Rightarrow a(2a-3)=3ab-c$

43. clearly $CHS \geq 2, RHS \leq 2 \Rightarrow CHS=RHS=2 \Rightarrow x=1, y=\frac{1}{4}$

44. Use $\cos ec\theta+\cot\theta=\cot\left(\frac{\theta}{2}\right)$

45. $l^2+m^2=3+2\left(\cos\frac{2\pi}{7}+\cos\frac{4\pi}{7}+\cos\frac{6\pi}{7}\right)=2$

$$l^2+m^2=-\left(\cos\frac{4\pi}{7}+\cos\frac{8\pi}{7}+\cos\frac{16\pi}{7}\right)-2\left(\cos\frac{6\pi}{7}+\cos\frac{12\pi}{7}+\cos\frac{10\pi}{7}\right)$$

$$=-\left(-\frac{1}{2}\right)-2\left(-\frac{1}{2}\right)=\frac{1}{2}+1=\frac{3}{2}$$

$$GE=\frac{2}{(3/2)}=\frac{4}{3}$$

46. $\sin^2\left(\frac{x+y}{2}\right)=1 \,\&\, \cos\left(\frac{x-y}{2}\right)=\frac{1}{2}$

$$GE=1+\left(\frac{1}{2}\right)^2=\frac{5}{4}$$

47. $b_0=\dfrac{\cos\frac{\pi}{4}}{\sin\frac{\pi}{4}}=\dfrac{2\cos^2\frac{\pi}{4}}{2\sin\frac{\pi}{4}}=\dfrac{1+\frac{\sqrt{3}+1}{2\sqrt{2}}}{\frac{\sqrt{3}-1}{2\sqrt{2}}}=2+\sqrt{6}+\sqrt{2}+\sqrt{3} \Rightarrow b_0=a_0+2$

48. $(x-1)^2+4=-4\cos(\alpha x+\beta) \Rightarrow x=1\, and\, \cos(\alpha x+\beta)=-1 \Rightarrow x=1 \,\&\, \alpha+\beta=3\pi$

$$GE=\tan\left(\frac{\alpha+\beta}{4}\right)=\tan\left(\frac{3\pi}{4}\right)=-1=\cos(\alpha+\beta)$$

49. $\left(2\sin\left(x+\frac{\pi}{6}\right)\right)^{\left|2\sin\left(x+\frac{\pi}{6}\right)\right|}=4 \Rightarrow \sin\left(x+\frac{\pi}{6}\right)=\pm1 \Rightarrow x=\frac{\pi}{3}\, and -\frac{2\pi}{3}$ No of solutions=2

50. $|2a\sin\theta-3|+|-a\sin\theta-1|+|5-a\sin\theta| \geq |2a\sin\theta-3-a\sin\theta-1+5-a\sin\theta| \geq 1$ G.E. has no solution for any $a \in R$

51. $\left.\begin{array}{l}\sin y = 2\sin x - (1)\\ \cos y = \dfrac{2}{3}\cos x - (2)\end{array}\right\} \sin^2 y + \cos^2 y = 4sin^2 x + \dfrac{4}{9}\cos^2 x \Rightarrow \tan^2 x = \dfrac{5}{27}$

Also $2^2 - 1^2 \Rightarrow \cos 2y = \dfrac{4}{9}\cos^2 x - 4\sin^2 x = \dfrac{4}{9}\cos^2 x - 4\left(1-\cos^2 x\right) = \dfrac{40}{9}\left(10\cos^2 x - 1\right)$

$$\tan(x+y) = \frac{\tan x + \tan y}{1 - \tan x \tan y} = \frac{4\tan x}{1 - 3\tan x} = \frac{4\times\dfrac{\sqrt{5}}{3\sqrt{3}}}{1 - \dfrac{15}{27}} = \frac{4\sqrt{5}}{3\sqrt{3}}\times\frac{27}{12} = \sqrt{15}$$

52. $A)\, Now \dfrac{x\tan A + y\tan B}{x+y} = \dfrac{k(\sin A + \sin B)}{k(\cos A + \cos B)} = \tan\left(\dfrac{A+B}{2}\right)$

$B)\, Now \dfrac{x\tan A + y\tan B}{x+y} = \dfrac{\sin A - \sin B}{\cos A + \cos B} = \tan\left(\dfrac{A-B}{2}\right)$

$C)\, \dfrac{y\sin A + x\sin B}{x+y} = \dfrac{\sin A\cos B + \cos A\sin B}{\sin A\cos B + \cos A\sin B} = \dfrac{\sin(A+B)}{\sin(A-B)}$

D) $x\tan A + y\tan B = k\cos A\tan A + k\cos B\tan B = k(\sin A + \sin B) \neq 0$

53.

54.

55.

56. $\cos\left(\dfrac{\pi}{4} - x\right)\cos 2x - \cos\left(\dfrac{\pi}{4} + x\right)\cos 2x + \sin x.2\sin x\cos x\sec x = \cos x.2\sin x\cos x\sec x$

$\Rightarrow \cos 2x\left(\sqrt{2}\sin x\right) + 2\sin^2 x - 2\sin\cos x = 0 \Rightarrow \sqrt{2}\sin x\left\{\cos 2x + \sqrt{2}\sin - \sqrt{2}\cos x\right\} = 0$

$\Rightarrow \sin x = 0(or)\cos x - \sin x = 0(or)\cos x + \sin x = \sqrt{2} \Rightarrow \sin x = 0, \tan x = 1(or)\cos x + \sin x = \sqrt{2} \Rightarrow \sec x = \phi(or)\sec x = \sqrt{2} \therefore GE = (1)^2 + \left(\sqrt{2}\right)^2 = 3$

57. $2\sin^2\left(\dfrac{\pi}{2}\cos^2 x\right) = 1 - \cos\left(\pi\sin^2 2x\right) \Rightarrow 2\sin^2\left(\dfrac{\pi}{2}\cos^2 x\right) = 2\sin^2\left(\dfrac{\pi}{2}\sin^2 2x\right)$

$\Rightarrow \dfrac{\pi}{2}\cos^2 x = n\pi \pm \dfrac{\pi}{2}\sin^2 2x \Rightarrow \cos^2 x = 2n\pi \pm \sin 2x$

$n = 0\, and \cos^2 x = \sin^2 2x \Rightarrow \sin^2 x = \dfrac{1}{4} \Rightarrow \cos 2x = \dfrac{1}{2} \Rightarrow \cos 4x = -\dfrac{1}{2} \Rightarrow \left|[8\cos 4x]\right| = 4$

58. $\dfrac{1+\tan\dfrac{y}{2}}{1-\tan\dfrac{y}{2}} = \left(\dfrac{1+\tan\dfrac{x}{2}}{1-\tan\dfrac{x}{2}}\right)^3 \Rightarrow SOBS \Rightarrow \dfrac{1+\sin y}{1-\sin y} = \dfrac{(1+\sin x)^3}{(1-\sin x)^3} \Rightarrow \sin y = \sin x\dfrac{\left(3+\sin^2 x\right)}{1+3\sin^2 x} \Rightarrow \underset{x\to 0}{Lt}\dfrac{\sin y}{x} = 3$

59. Consider $\sum_{\wedge=0}^{10}\cos^3\left(\frac{\pi r}{3}\right)=\frac{1}{4}\left\{\sum_{\wedge=0}^{10}\cos(\pi r)+3\sum_{\wedge=0}^{10}\cos\frac{\pi r}{3}\right\}$

$=\frac{1}{4}\left\{1+3\left(-\frac{1}{2}\right)\right\}=-\frac{1}{8}\therefore GE=\left|8\left(-\frac{1}{8}\right)\right|=1$

60. $\sin\frac{x}{3}=1\Rightarrow\frac{x}{3}=2n\pi+\frac{\pi}{2}\Rightarrow x=\frac{3}{2}(4n+1)\pi$

$\sin\frac{x}{11}=1\Rightarrow\frac{x}{11}=2m\pi+\frac{\pi}{2}\Rightarrow x=\frac{11}{2}(4m+1)\pi$

$3(4m+1)\Rightarrow 3,15,27,39,51,63,75,99\ \ (c.d=12)$

$11(4m+1)\Rightarrow 11,55,99\ \ (c.d=44)$

$\therefore x=99\times\frac{\pi}{2}=99\times 90^0=8910^0$

First digit=8