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: 22-08-15**

Time: 9:00 AM to 12:00 Noon **RPTM-4** **Max.Marks: 360**

KEY SHEET

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

MATHS

31.

$$\text{OA=OB}, \angle AoB = \alpha \Rightarrow Z_2 = Z_1 cis\alpha$$
$$\Rightarrow Z_2 - Z_1 cos\alpha = Z_1 i \sin\alpha$$
$$\Rightarrow Z_2^{\,2} + Z_1^{\,2} cos^2\alpha - 2Z_1 Z_2 \cos\alpha = -Z_1^{\,2}\sin^2\alpha$$
$$\Rightarrow Z_1^{\,2} + Z_2^{\,2} = 2Z_1 Z_2 \cos\alpha$$
$$(Z_1 + Z_2)^2 = 2Z_1 Z_2 (1+\cos\alpha)$$
$$\Rightarrow \frac{p^2}{q} = 2(1+\cos\alpha) = 4\cos^2\frac{\alpha}{2}$$

32. $\sum_{r=1}^{10}(r-w)(r-w^2) = 450 \ \sin ce\ w + w^2 = -1, w^3 = 1$

33. $z = re^{i\theta}, \bar{z} = re^{-i\theta}$

$$\left|\frac{z}{r} - \frac{\vec{z}}{r}\right| = \left|2i\sin\theta\right| \le \left|\arg z - \arg\vec{z}\right|$$

$$\Rightarrow \left|z - \vec{z}\right| \le |z|\left|\arg z - \arg\vec{z}\right|$$

34 $put\ z = x + iy$

35. $\left(\frac{1+i}{1-i}\right)^n = \frac{2}{\pi}\sin^{-1}\left(\frac{x^2+1}{2x}\right) x > 0$

$$\Rightarrow \left(\frac{1+i}{1-i}\right)^n = \frac{2}{\pi}.\frac{\pi}{2}$$

$\Rightarrow least\ value\ of\ n\ \ is\ 4$

36. $\frac{z^n - 1}{z-1} = (z-w)(z-w^2) - (z-w^{n-1})$

Take 'log' both sides and diff w.r. to z both sides and put $z = 2$

37. $z^5 = (z-1)^5 \Rightarrow |z| = |z-1| = 1\ \text{Re}(z) = \frac{-1}{2}$

$\therefore$ The roots lie on line $\text{Re}|z| = \frac{-1}{2}$

38. $\log_2\left|\left(\alpha + \alpha^2 + \alpha^3 + 1\right) - \alpha^4\right|$

$\log_2\left|-2\alpha^4\right| = \log_2^2 = 1$

39. $z^{100}-1=(z-1)(z-\alpha_1)(z-\alpha_2)....(z-\alpha_{99})=0$

Sum of roots = $1+\alpha_1+\alpha_2+.....+\alpha_{99}=0$

Sum of roots taken two at a time = 0

$\Rightarrow \sum_{1\le i<i\le 99}\alpha_i\alpha_j+\alpha_1+\alpha_2+.....\alpha_{99}=0$

$\Rightarrow \Sigma\alpha_i\alpha_j=1$

40. $\alpha = cisx,\ \beta = cisy\ ,\gamma = cisz$ Given

$\alpha + 2\beta + 3\gamma = 0 \Rightarrow \alpha^3 + 8\beta^3 + 27\gamma^3 = 18\alpha\beta\gamma$

$\Rightarrow \sin 3x + 8\sin 3y + 27\sin 3z = 18\sin(x+y+z)$

41. $z_1(z_1^2-3z_2^2)=2 \qquad -(1)$

$z_2(3z_1^2-z_2^2)=11 \qquad -(2)$

Multiply (2) by i add to $(1) \Rightarrow (z_1+iz_2)^3 = 2+11i$

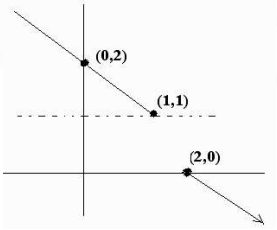
Multiply (2) by i substract from $(1) \Rightarrow (z_1-iz_2)^3 = 2-11i$

$\Rightarrow (z_1+iz_2)^3(z_1-iz_2)^3 = 125$

$\Rightarrow (z_1^2+z_2^2)^3 = 125 \Rightarrow z_1^2+z_2^2 = 5$

42. Arg $\left(z-(1+i)\right) = \begin{cases} \frac{3\pi}{4} & x\le 1 \\ \frac{-\pi}{4} & x>2 \end{cases}$

$\therefore$ *The locus of z is* Set of two rays



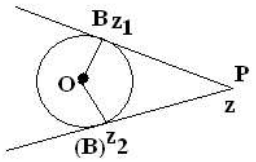
43. $x=6$ *and* $(x-3)^2+(y+3)^2=9 \Rightarrow y=-3$

44. $OA \perp PA$

$$\frac{z_1}{\bar{z}_1} + \frac{z - z_1}{\bar{z} - \bar{z}_1} = 0$$

$$Similarly\ OB \perp PB \Rightarrow \frac{z_2}{\bar{z}_2} + \frac{z - z_2}{\bar{z} - \bar{z}_2} = 0$$

On eliminating $\bar{z}$ we get $z = \frac{2z_1 z_2}{z_1 + z_2}$



45. $ln\ \frac{1}{3}\left(\frac{|z-3|^2 + 2}{11|z-3| - 2}\right) > 1$

$$\Rightarrow \frac{|z-3|^2 + 2}{11|z-3| - 2} < \frac{1}{3}$$

$$\Rightarrow 3t^2 + 6 < 11t - 2$$

$$\Rightarrow 3t^2 - 11t + 8 < 0$$

$$(3t - 8)(t - 1) < 0$$

$$1 < t < 8/3$$

$$1 < |z-3| < 8/3$$

46. For any $z_1, z_2 \in \mathbb{C}, |az_1 - bz_2|^2 + |bz_1 + az_2|^2 = (a^2 + b^2)\left(|z_1|^2 + |z_2|^2\right)$

47. The locu1 of z is part of $|z - 7 - 9i| = 3\sqrt{2}$

48. $w = \frac{z-1}{z+1}$

$$\Rightarrow z = \frac{1+w}{1-w}$$

$$|z| = 1$$

$\Rightarrow |1+w| = |1-w|$

$\Rightarrow w \text{ lies on imaginary axis}$

$\therefore \text{Re}(w) = 0$

49. A(-1, 1) B(5, 1) are diameter ends of a circle and P(z) is on the circle

$|z+1-i|^2 + |z-5-i|^2 = AB^2 = 36$

50.

$\alpha + \beta = -a$

$\alpha\beta = b^2$

$\frac{a^2}{b^2} = \frac{\alpha}{\beta} + \frac{\beta}{\alpha} + 2$

$= 2 + \frac{2}{r^2} Re\left(\alpha\bar{\beta}\right)$

51. $b^2 = ac$

52.

The equation is $10\left(x^2+y^2\right) - 3i(2x)(2iy) - 6 = 0$ c

$\Rightarrow 5\left(x^2+y^2\right) + 6xy - 8 = 0 \rightarrow (1)$

Let $(r\sin\theta, r\cos\theta)$ be the point on (1)

then $5r^2 + 6r^2 \sin\theta\cos\theta = 0 \Rightarrow r^2 = \frac{8}{5+3\sin 2\theta}$

$\therefore r_1 + r_2 = 2 + 1 = 3$

53. $z_1 = r.e^{i\theta} \Rightarrow \tan\theta = \sqrt{2} - 1 \Rightarrow \theta = \frac{\pi}{8} \Rightarrow 2\theta = \frac{\pi}{4} \Rightarrow n = 8$

54. $z_1 = \frac{1}{2} - 2i \Rightarrow G.E. = \frac{\sqrt{17}}{2} - \tan^{-1}(4)$

55. $G = S \Rightarrow \frac{z_1+z_2+z_3}{3} = 1 \Rightarrow z_1+z_2+z_3 = 3 \Rightarrow \sum z_1^2 + 2\sum z_1 z_2 = 9 \Rightarrow \frac{9-\sum z_1^2}{\sum z_1 z_2} = 2$

56.

$z^4 + z^3 + 2 = (z-z_1)(z-z_2)(z-z_3)(z-z_4)$

$put\ z = \frac{-1}{2}$

57. Maximum value of $|3+i(3-i)|$ is $2\sqrt{2}$

$G.E. = \left[2\sqrt{2}\right] = 2$

58. $G.E \le 3(4+9+16) \le 87$

59 Put z = x+ iy and find the vertices, Area = 62 sq.u

60. Clearly $z = -\sqrt{3} - 3i \Rightarrow \frac{z}{2\sqrt{3}} = -\left(\frac{1}{2} + \frac{i\sqrt{3}}{2}\right)$