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: 16-08-15**
Time: 3 Hours **2012-P2-Model** **Max Marks: 198**

KEY & SOLUTIONS

PHYSICS

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

CHEMISTRY

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

MATHS

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

MATHS

41.

Sol:- If ellipse and hyperbola intersects at (x,y) then

$x^2 = \frac{\ell_2^2}{e_e^2}, e_e =$ Eccentricity of ellipse

$(SP)(S'P) = \ell_1^2 - e_e^2 x^2 = \ell_1^2 - \ell_2^2$

42. Transverse axis is the equation of the angle bisector containing point (2,3), which is given by

$\frac{3x-4y+5}{5} = \frac{12x+5y-40}{13}$

or $21x + 77y = 265$

43. conceptual

44. Point lies on $25x^2 + 9y^2 = 450$ and is outside $3x^2 + 5y^2 = 32$

45.

Sol:- $\frac{x^2}{169} + \frac{y^2}{25} = 1$ Equation of normal at the point $(13\cos\theta, 5\sin\theta)$ is

(1) $\frac{13x}{\cos\theta} - \frac{5y}{\sin\theta} = 144.$ It passes through (0,6), So

$(15 + 72\sin\theta) = 0$

$\Rightarrow \sin\theta = -\frac{5}{24}$

$\Rightarrow \theta = 2\pi - \sin^{-1}\left(\frac{5}{24}\right),$

and $\pi + \sin^{-1}\frac{5}{24}$

Also the y-axis is one of the normals.

46.

47.

48.

Paragraph Question:-

Paragraph - I

49-50

Sol:- $(ON)(OQ) = 2c^2 \Rightarrow c = \sqrt{2}$

Equation of hyperbola is $(x-1)(y-2) = 2$. Its foci (-1,0) (3,4) and equation of directrix is x + y – 5 = 0, x + y – 7 = 0 is the equation of latus rectum of ellipse and tangents at end points of latus rectum always intersects on corresponding directrix.

Paragraph - II

51. Solving the curves given (eliminating x^2), we have

$$\frac{r^2 - y^2}{16} + \frac{y^2}{9} = 1$$

$$\Rightarrow y^2 = \frac{144 - 9r^2}{7}$$

Solving the curves given (eliminating y^2), we have

$$\frac{x^2}{16} + \frac{r^2 - x^2}{9} = 1$$

$$\Rightarrow x^2 = \frac{16r^2 - 144}{7}$$

If ABCD is a square, then

$$x^2 = y^2$$

or $$\frac{144 - 9r^2}{7} = \frac{16r^2 - 144}{7}$$

or $$25r^2 = 288$$

or $$r = \frac{12}{5}\sqrt{2}$$

52. Tangents of slope *m* to circle and ellipse is $y = mx \pm \sqrt{r^2m^2 + r^2}$ and $y = mx \pm \sqrt{16m^2 + 9}$, respectively. For common tangent, $r^2m^2 + r^2 = 16m^2 + 9$

Also if A'B'C'D' is a square, then

$$m = \pm 1$$

$$\Rightarrow r^2 + r^2 = 25$$

$$\Rightarrow r = 5/\sqrt{2}$$

Paragraph - III

53. Equation of the ellipse is $2x^2 + 6y^2 = 9$

54.

55. Conceptual

56. Let the coordinates of point A are (ct, c/t)

So, the slope of normal at A will be t^2

And normal will be parallel to BC.

So, t will be $\pm\sqrt{2} \Rightarrow c = \pm 2$

57. a, b, c are in A.P $\Rightarrow ax + by + c = 0$ are concurrent at $(1, -2)$

$\therefore$ centre of auxiliary circle $= (-\alpha, -\beta) = (1, -2)$

Radius of aux. circle = 2; Length of major axis = 4 = 2A

$\because \frac{1}{SP} + \frac{1}{SQ} = \frac{2A}{B^2} \Rightarrow B = \sqrt{3}$, hence $e = \frac{1}{2}$

58. Other asymptote is the image of $y = 2x$ in the line $x = y$ .i.e, $x = 2y$

$\Rightarrow$ Hyperbola is $(x - 2y)(2x - y) = K$

$\because$ It passes through (3, 4) $\Rightarrow K = -10$

$\because$ angle between asymptotes $= 2\sec^{-1} e$

$\Rightarrow \tan^{-1}\left(\frac{3}{4}\right) = 2\sec^{-1} e \Rightarrow e = \frac{\sqrt{10}}{3}$

59. conceptual

60. The equation of chord joining P and Q is $x + yt_1t_2 = c(t_1 + t_2)$ ....(i)

And the equation of chord joining Q and R is $x + yt_2t_3 = c(t_2 + t_3)$ .....(ii)

Let Eq. (i) be parallel to $y = m_1x$ and Eq. (ii) be parallel to $y = m_2x$.

$\therefore$ $m_1 = -\frac{1}{t_1t_2}$ and $m_2 = -\frac{1}{t_2t_3}$

$\therefore$ $\frac{m_1}{m_2} = \frac{t_3}{t_1} ie, t_3 = \left(\frac{m_1}{m_2}\right)t_1$ .....(iii)

Again the equation to the third side RP is $x + yt_3t_1 = c(t_3 + t_1)$

$$x + y\left(\frac{m_1}{m_2}\right)t_1^2 = c\left(\frac{m_1}{m_2}t_1 + t_1\right)$$ or

$ym_1t_1^2 - ct_1(m_1 + m_2) + xm_2 = 0$ .....(iv)

t_1 being a parameter. Since, t_1 is real the envelope of Eq.(iv) is given by the discriminate of Eq.(iv) = 0 ie, $c^2(m_1 + m_2)^2 - 4ym_1.xm_2 = 0$ or $4m_1m_2xy = c^2(m_1 + m_2)^2$ .....(v)

$\because$ m_1 and m_2 are roots of $x^2 - 6x + 1 = 0$ $\therefore$ $m_1 + m_2 = 6, m_1m_2 = 1$

Then from Eq. (v), $4xy = c^2(6)^2$ Then $xy = 9c^2$ $\therefore$ $\lambda = 9$