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 | **Dt: 27-09-15**

Time: 09:00 AM to 12:00 Noon | **RPTA-8** | **Max.Marks: 180**

PAPER-1

KEY & SOLUTIONS

PHYSICS

1	**BD**	2	**BC**	3	**BCD**	4	**BD**	5	**CD**	6	**BC**
7	**ABCD**	8	**ABCD**	9	**BCD**	10	**CD**	11	**3**	12	**5**
13	**5**	14	**2**	15	**1**	16	**2**	17	**4**	18	**3**
19	**8**	20	**4**								

CHEMISTRY

21	**ABCD**	22	**AB**	23	**ABCD**	24	**AB**	25	**D**	26	**ABC**
27	**AB**	28	**AD**	29	**ACD**	30	**ABCD**	31	**1**	32	**1**
33	**3**	34	**6**	35	**4**	36	**0**	37	**6**	38	**2**
39	**2**	40	**6**								

MATHS

41	**CD**	42	**ABC**	43	**AC**	44	**CD**	45	**ACD**	46	**ACD**
47	**ACD**	48	**ABC**	49	**ABCD**	50	**ABD**	51	**4**	52	**7**
53	**1**	54	**2**	55	**8**	56	**6**	57	**2**	58	**1**
59	**5**	60	**9**								

MATHS

42. (A) $A=\begin{bmatrix}0&0&1\\0&0&0\\0&1&0\end{bmatrix}$; $B=\begin{bmatrix}0&0&1\\1&0&0\\0&0&0\end{bmatrix}$

is a counter example. Therefore, (A) is wrong.

(B) We have $(A^2 + B^2)(A - B) = A^3 - B^3 - A^2B + B^2A = 0$

and $A-B\neq 0 \Rightarrow A^2 + B^2$ is not invertible. Therefore (B) is also wrong.

(C) $A^T = A$

$\left(\left(A^{-1}\right)^{-1}\right)^{-1}=A^{-1}$

$\left(A^{-1}\right)^{T}=\left(A^{T}\right)^{-1}=A^{-1}$

So, $\left(\left(A^{-1}\right)^{-1}\right)^{-1}$ is also symmetric. Therefore (C) is also wrong.

(D) $|A|\neq 0, |B|\neq 0 \Rightarrow |AB|\neq 0$

So, AB is invertible. Therefore (D) is correct.

43. $\begin{vmatrix}1&-\cos\theta&\cos 2\theta\\ \cos 2\theta&-1&\cos\theta\\ \cos 2\theta&-\cos\theta&1\end{vmatrix}=0$

44. $\text{disc}\geq 0$, $a<3$ and $f(3)>0$ where $f(x)=x^2-2ax+a^2+a-3$

45 : $t^2+at+1=0 \Rightarrow 3^x=\dfrac{-a\pm\sqrt{a^2-4}}{2}$

has Z solutions a < 0 and a < - 2 or a > 2

two solutions $a\varepsilon(-\infty,-2)$

no solutions if $a\varepsilon(-2,-\infty)$

exactly one solution if a a = {-2}

at least one real solution if $a\varepsilon(-\infty,-2)$

46 : Let $f(x)=(x-a_1)(x-a_3)(x-a_5)+3(x-a_2)(x-a_4)(x-a_6)$

Note that, $f(x)\to-\infty$ as $x\to-\infty$

$f(a_1)=3(a_1-a_2)(a_1-a_4)(a_1-a_6)<0$

Similarly, $f(a_2)>0, f(a_3)>0, f(a_4)<0, f(a_5)<0, f(a_6)<0$

Thus, f(x) = 0 has a root in each of the following intervals $(a_1,a_2),(a_3,a_4)\&(a_5,a_6)$.

Thus f(x) = 0 has three real roots.

47. Determinants in (A), (B) and (D) are zero, and in (C) the determinant is non zero.

48. Given equation are

$x^2 + ax + b = 0$ --(1)

$xy + l(x + y) + m = 0$ --(2)

From (2), we get, $x(y+1) = -(m+ly)$

$\therefore x = -\left(\frac{m+ly}{y+l}\right)$

Substituting this value in (1), we have

$\left(\frac{m+ly}{y+l}\right)^2 - a\left(\frac{m+ly}{y+l}\right) + b = 0$

or $(m+ly)^2 - a(m+ly)(y+l) + b(y+l)^2 = 0$

or $(y^2l^2 + b - al) + y(2lm + 2bl - al^2 - am) + m^2 - alm + bl^2 = 0$

Since this equation is equivalent to (1)

$\therefore \frac{l^2 - al + b}{l} = \frac{2lm - al^2 - am + 2bl}{a} = \frac{m^2 - alm + bl^2}{b}$

From 1st and third fraction

$b(l^2 - al + b) = m^2 - alm + bl^2$

$i.e\ al(b-m) - (b^2 - m^2) = 0$

$or\ (b-m)(al - b - m) = 0$

$\therefore$ either $b = m$ or $b + m = al$

From 1st and second fraction, putting $b = m$

$al^2 - a^2l + am = 4lm - al^2 - am$

or $2al^2 - a^2l - 4lm - 2am = 0$

or $a^2l - 2a(l^2 + m) + 4lm = 0$

or $(a - 2l)(al - 2m) = 0$

$\therefore a = 2l\ or\ al = 2m$

Thus either $b = m$ and $a = 2l$

$b = m$ and $al = 2m$

49. $|\alpha| =$ sum of roots $= b + a$

$-|\beta| =$ product of root $= ab$

Because $|a| < |b|$ so a is negative and b is positive.

Now, $|\alpha| < b - 1 \Rightarrow a + b < b - 1 = a < -1.$

Because a is negative so magnitude of 'a' is greater than one and magnitude of b is greater than $1 + |\alpha|$ or say greater than 2.

Now, $\log_{|a|}\left(\frac{x}{b}\right)^2 - 1 = 0 \Rightarrow \left(\frac{x}{b}\right)^2 = |a|$

$\Rightarrow \quad x = \pm b\sqrt{|a|}$

Magnitude of x is greater than $'a'$ as well as greater than $'b'$

$\Rightarrow$ one root lies in $\Rightarrow (-\infty, a)$ and other root lies in (b, ∞).

50. Let $\alpha \& \beta$ are the roots of

$Ax^2 + Bx + c = 0$

$\because |ax^2 + bx + c| \leq |Ax^2 + Bx + c| \quad \forall \in R$

$\Rightarrow ax^2 + bx + c = 0$ also has α, β as roots

$\Rightarrow |ax^2 + bx + c| = |a|\ |x-\alpha||x-\beta| = |A|\,|x-\alpha||x-\beta|$ 48.

$\Rightarrow |a| \leq |A|$

&

$(\alpha-\beta)^2 = (\alpha+\beta)^2 - 4\alpha\beta \Rightarrow \dfrac{b^2-4ac}{a^2} = \dfrac{B^2-4AC}{A^2} \Rightarrow |d| \leq |D|$

$(2n+1)^2 - (2m+1)^2 = 4(m+n+1)(n-m) = \text{multiple of } 8$

51. Since $P(x)$ divides into both of them

Hence P(x) also divides

$(3x^4 + 4x^2 + 28x + 5) - 3(x^4 + 6x^2 + 25)$

$= -14x^2 + 28x - 70 = -14(x^2 - 2x + 5)$

Which is a quadratic, Hence $P(x) = x^2 - 2x + 5$

$\therefore P(1) = 4$

52. We have $a^2 - (2x^2+1)a + x^4 + x = 0$

$$\therefore a = \frac{(2x^2+1) \pm \sqrt{(2x^2+1)^2 - 4(x^4+x)}}{2}$$

$2a = (2x^2+1) \pm (2x-1)$

On solving +ve & -ve sign we got

$a \geq \dfrac{3}{4}$

$\therefore m + n = 7$

53. Let $x^2 + x = y \Rightarrow (y-2)(y-3) = 12$

$\Rightarrow y = -1, 6\ ; \quad x^2+x+1=0 \ \Rightarrow x = \omega, \omega^2$

54. We have $x_1 + x_2 + x_3 = -p$ ….. (1)

$x_1x_2 + x_1x_3 + x_2x_3 = q$ ….. (2)

$x_1x_2x_3 = -r$ ….. (3)

$x_1^2 = x_2x_3$ ….. (4)

from (2)

$x_1x_2 + x_1x_3 + x_1^2 = q$

$x_1(x_1 + x_2 + x_3) = q$

$x_1 = -\frac{q}{p}$

$\Rightarrow px_1 + q = 0 \Rightarrow K_1 = 1$ …. (5)

from (1)

$x_2 + x_3 = \frac{q - p^2}{p}$ ….. (6)

$x_2x_3 = \frac{rp}{q}$ ….. (7)

Hence, x_2, x_3 satisfy the equation $pqx^2 - (q - p^2)qx + p^2r = 0$

$\Rightarrow K_2 = 1$ …. (8)

From (5) and (8)

$K_1 + K_2 = 2$

55. Let α, β, γ, δ be four positive real roots of given equation.

Then $\alpha + \beta + \gamma + \delta = -p$

$\Sigma\alpha\beta = q$

$\Sigma\alpha\beta\gamma = -r$

$\alpha\beta\gamma\delta = 5$

using A.M. ≥ G.M.

$$\frac{\alpha + \beta + \gamma + \delta}{4} \geq (\alpha\beta\gamma\delta)^{1/4}$$

$$\frac{\Sigma\alpha\beta\gamma}{4} \geq (\alpha^3\beta^3\gamma^3\delta^3)^{1/4}$$

$$\frac{(\Sigma\alpha).(\Sigma\alpha\beta\gamma)}{16} \geq (\alpha\beta\gamma\delta)$$

$pr \geq 80$

56. For non-diagonal entries, we required even no. of 1, even no. of –1 and even no. of 0, for diagonal three entries are remained, –1, 0, 1. So no. of cases in which trace = 0 are 3! And no. of symmetric matrices for each arrangement of 1, –1, 0 in diagonal = 3!

Total such matrices = 3! × 3! = 36

57. $a_{ij} = 0 \ \forall \ i \neq j$ and $a_{ij} = (n-1)^2 + i \ \forall \ i = j$

Sum of all the element of $A_n = \sum_{i=1}^{2n-1} [(n-1)^2 + i]$

$= (2n-1)(n-1)^2 + (2n-1)n = 2n^3 - 3n^2 + 3n - 1 = n^3 + (n-1)^3$

So, $T_n = (-1)^n [n^3 + (n-1)^3] = (-1)^n n^3 - (-1)^{n-1} (n-1)^3 = V_n - V_{n-1}$

$\Rightarrow \sum_{n=1}^{102} T_n = \sum_{n=1}^{102} (V_n - V_{n-1}) = V_{102} - V_0 = (102)^3$

$\left[\dfrac{\sum_{n=1}^{102} T_n}{520200} \right] = 2.$

58. $\dfrac{|\text{adj } B|}{|C|} = \dfrac{|\text{adj}(\text{adj} A)|}{|5A|} = \dfrac{|A|^{(3-1)^2}}{5^3|A|} = \dfrac{|A|^3}{125}$

Now $|A| = 5$

$\therefore \quad \dfrac{|\text{adj } B|}{|C|} = 1$ Ans.

60. $(x_1x_2 - x_1x_4)^2 + (x_2x_3 - x_2x_5)^2 + \ldots + (x_5x_2 - x_5x_4)^2 \le 0$

$\Rightarrow x_1 = x_2 = x_3 = x_4 = x_5 = 3$

Hence $|A| = 3^5 = 243$.