DIRECTORATE OF SCHOOL EDUCATION TAMILNADU

12JPCM02 (2023-24)	JEE PRACTICE QUESTIONS (TEST-2)	Class : XII Time : 1.15 hrs Total Marks : 180

Answer key

12th – MATHS

31. A)

Let $\alpha = \sin\theta$ $\beta = \cos\theta$

Sum of the roots $\sin\theta + \cos\theta = \frac{-m}{l}$ (1)

Product of the roots $\sin\theta \cos\theta = \frac{n}{l}$ (2)

$(1)^2 + (2)^2 \Rightarrow 1 + 2\sin\theta\cos\theta = \frac{m^2}{l^2}$

$1 + \frac{2n}{l} - \frac{m^2}{l^2} \Rightarrow \therefore l^2 - m^2 + 2nl = 0$

32. A)

The given equation $2x^3 + ox^2 = 5x + 1 = 0$

Sum of the roots = $= -b/a = 0/2 = 0$

33. B)

$2\cos^2 x - 5\cos x + 2 = 0$

$(2\cos x - 1)(\cos x - 2) = 0$

Cos x = $1/2$ — $\cos x = 2$

$\therefore x = 60°$ — There is no solution for $\cos x = 2$

cos x lies in $-1 \le \cos x \le 1$

34. B)

(1-p) is root of the equation $x^2 + px + (1-p) = 0$

(1-p) satisfies the above equation

$(1 - p)^2 + p(1 - p) + (1 - p) = 0$

$(1 – p) (1 – p + p + 1) = 0$

$(1 – p) (2) = 0$

put p = 1 in the above equation

$x^2 + x = 0$

$x (x+1) = 0$

$x = 0, x = -1$

35. A)

Let 2, 3 and x are the roots

$S_1 = 2 + 3 + x = \frac{-m}{2} \Rightarrow 5 + x = \frac{-m}{2}$ (1)

$S_3 = 6x = \frac{-n}{2}$ (2)

$S_2 = 6 + 5x = \frac{-13}{2}$

$\Rightarrow 5x = \frac{-13}{2} - 6$

$x = \frac{-5}{2}$ put $x = \frac{-5}{2}$ in (1) we get m = -5

Put $x = \frac{-5}{2}$ (2) we get n = 30

36. B)

sum of the roots $\alpha + \beta = -\frac{(2a+3)}{a+1}$

product of the roots $\alpha\beta = \frac{4}{a+1}$ and $\alpha\beta = 2$

$\therefore \frac{4}{a+1} = 1 \Rightarrow a = 1$

$\Rightarrow \alpha + \beta = \frac{-5}{2}$

37. C)

Let the real part is 12 and modulus is 13

$\therefore \alpha = 12 + 5i and \beta = 12 - 5i$

SOR = 24 POR = 169

$\therefore x^2 - 24x + 169 = 0$

38. B)

Solving the two equation we get

$$(a - b)\, x = (a - b)$$

$$x = 1$$

put $x = 1$ *in* $x^2 + bx + a = 0$

$$a + b - 1$$

39. A)

Let α, β, are the roots of the equation $x^2 + px + q = 0$

SoR, $\alpha + \beta = -P \Rightarrow \alpha + P = -\beta$

PoR, $\alpha\beta = q \Rightarrow 1\alpha = \frac{q}{\beta}$

γ, δ Are the roots of the equation $x^2 + px - r = 0$

SoR, $\gamma + \delta = -p$

PoR, $\gamma\delta = -r$

Now $(x-\gamma)(x-\delta) = x^2 - (\gamma+\delta)x + \gamma\delta$

$= x^2 + px - r$

$= x\,(x+p) - r$

$= \frac{q}{\beta}(-\beta) - r \Rightarrow -(q+r)$

40. Given that $f(x) = ax^2 + bx + c$ and one root is 3

$f(-1) + f(2) \Rightarrow a - b + c + 4a + 2b + c$

$\Rightarrow 5a + b + 2c = 0$ (1)

$f(3) \Rightarrow 9a + 3b + c = 0$ (2)

Solving (1) & (2) $6a + 5c = 0 \Rightarrow \frac{c}{a} = \frac{-6}{5}$

Product of the root $\alpha\beta = {}^{c}\!/_{a} \Rightarrow \alpha\beta = -\frac{6}{5}$

$$\alpha(3) = -\frac{6}{5}$$

$$\alpha = \frac{-2}{5}$$

so it lies on (-1, 0)

41. Given that

$$\sqrt{x+1} - \sqrt{x-1} = \sqrt{4x-1}$$

Squaring on both side

$$x + 1 + x - 1 - 2\sqrt{x+1}\sqrt{x-1} = 4x - 1$$

$$2x - 2\sqrt{x^2 - 1} = 4x - 1$$
$$1 - 2x = 2\sqrt{x^2 - 1}$$

again squaring on both side

$$5 - 4x = 0$$
$$4x = 5 \Rightarrow x = \frac{5}{4}$$

$\therefore$ x has one solution

42. D)

Given that $\frac{\alpha}{\beta} + \frac{\beta}{\alpha} = 4$

SoR $\alpha + \beta = -\left(\frac{T+1}{T}\right)$

PoR $\alpha\beta = \frac{5}{T}$

$$\alpha^2 + \beta^2 = 4\alpha\beta$$
$$\alpha^2 + \beta^2 = (\alpha + \beta)^2 - 2\alpha\beta = 4\alpha\beta$$
$$(\alpha + \beta)^2 = 6\alpha\beta$$
$$\left[-\left(\frac{T-11}{T}\right)\right]^2 = 6\alpha\beta$$
$$(T+1)^2 = 30T$$
$$T^2 - 28T + 1 = 0$$

SoR, $\lambda_1 + \lambda_2 = 28$

PoR, $\lambda_1 \lambda_2 = 1$

$$\therefore \frac{\lambda_1 + \lambda_2}{\lambda_2 + \lambda_1} = \frac{\lambda_1^2 + \lambda_2^2}{\lambda_1 \lambda_2}$$
$$(\lambda_1 + \lambda_2)^2 - 2\lambda_1\lambda_2$$
$$= 28^2 - 2$$
$$= 782$$

43.

Let $x-1 = t^2$

$$\sqrt{t^2 + 4 - 4t} + \sqrt{t^2 + 9 - 6t} = 1$$
$$\sqrt{(t-2)^2} + \sqrt{(t-3)^2} = 1$$
$$(t - 2) + (t - 3) = 1$$
$$2t - 5 = 1$$
$$2t = 6 \Rightarrow t = 3$$
$$2 \le t \le 3$$
$$4 \le t^2 \le 9$$
$$4 \le x - 1 \le 9$$

$5 \leq x \leq 10$

x lies on [5, 10]

44. B)

Expanding by 1st row we get

$x^3 - 7x + 6 = 0$

sum of the roots $a + \beta = 0$

45. A)

Let a and β are the roots of the equation $x^2 + ax + 12 = 0$

SoR $a + \beta = -a$ *PoR* $a\beta = 12$

a and γ are the roots of the equation $x^2 + bx + 15 = 0$

SoR $a + \gamma = -b$ *PoR* $\gamma\delta = 15$

a and δ are the roots of the equation $x^2 + (a+b)x + 36 = 0$

SoR $a + \delta = -(a+b)$ *PoR* $a\delta = 36$

The above equation have a common mut x then

$a\beta = 12$

$a\gamma = 15$

$a\delta = 36$

Clearly we k new that

$a = 3, \beta = 4, \gamma = 5, \delta = 12$

$\therefore \alpha + \beta = -a \Rightarrow a = -7$

$\alpha + \gamma = -b \Rightarrow b = -8$

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