Manzil JEE 2025

Mathematics

Quadratic Equations

DPP: 4

Q1 If α, β are the roots of equation $(k+1)x^2-(20k+14)x+91k+40=0$;, $(\alpha<\beta)k>0$ then answer the following questions.
The larger root (β) lie in the interval :
(A) (4,7)
(B) (7,10)
(C) (10,13)
(D) None of these

Q2 If the equation $ax^2+2bx+c=0$ and $ax^2+2cx+b=0, a\neq 0, b\neq c$, have a common root, then their other roots are the roots of the quadratic equation:
(A) $a^2x(x+1)+4bc=0$
(B) $a^2x(x+1)+8bc=0$
(C) $a^2x(x+2)+8bc=0$
(D) $a^2x(1+2x)+8bc=0$

Q3 The values of k for which the quadratic equation $kx^2+1=kx+3x-11x^2$ has real and equal roots are:
(A) $-11,-3$
(B) $5,7$
(C) $5,-7$
(D) NOT

Q4 Let $P(x)=4x^2+6x+4$ and $Q(y)=4y^2-12y+25$. If x, y satisfy equation $P(x)\cdot Q(y)=28$, then the value of $11y-26x$ is -
(A) 6
(B) 36
(C) 8
(D) 42

Q5 If $\operatorname{cosec}^2\alpha x^2+x+\left(\beta^2-\beta+\frac{1}{2}\right)=0$ has real roots, then $\sin^2\alpha+\left(\cos\left(\sin^{-1}\beta\right)\right)^2$ equals
(A) $\frac{3}{4}$
(B) $\frac{7}{4}$
(C) $\frac{11}{4}$
(D) $\frac{15}{4}$

Q6 Let x and y be two 2-digit numbers such that y is obtained by reversing the digits of x. Suppose they also satisfy $x^2-y^2=m^2$ for some positive integer m. The value of $x+y+m$ is.
(A) 88
(B) 112
(C) 144
(D) 154

Q7 Difference between the corresponding roots of $x^2+ax+b=0$ and $x^2+bx+a=0$ is same and $a\neq b$, then
(A) $a+b+4=0$
(B) $a+b-4=0$
(C) $a-b-4=0$
(D) $a-b+4=0$

Q8 The number or real roots of: $(x+3)^4+(x+5)^4=16$ is
(A) 0
(B) 2
(C) 3
(D) 4

Q9 If the roots of the quadratic equation $\mathrm{x}^2+\mathrm{px}+\mathrm{q}=0$ are $\tan 30^\circ$ and $\tan 15^\circ$ respectively, then the value of $(2+q-p)$ is
(A) 3
(B) 0
(C) 1
(D) 2

Q10 If r be the ratio of the roots of the equation $ax^2+bx+c=0$, then $\frac{(r+1)^2}{r}$ is equal to
(A) $\frac{a^2}{bc}$

(B) $\frac{b^2}{ac}$
(C) $\frac{c^2}{ab}$
(D) none of these

Q11 The set of values of p for which the roots of the equation $3x^2+2x+p(p-1)=0$ are of opposite sign is
(A) $(-\infty, 0)$
(B) $(0,1)$
(C) $(1, \infty)$
(D) $(0, \infty)$

Q12 If both the root of
$\mathrm{k}\left(6x^2+3\right)+rx+2x^2-1=0$ and
$6k\left(2x^2+1\right)+px+4x^2-2=0$ are common, then $2r-p$ is equal to
(A) -1 (B) 0
(C) 1 (D) 2

Q13 The complete set of values of $'a'$ for which the inequality
$(a-1)x^2-(a+1)x+(a-1) \geq 0$ is true for all $x \geq 2$.
(A) $\left(\frac{3}{7}, 1\right]$
(B) $(-\infty, 1)$
(C) $\left(-\infty, \frac{7}{3}\right]$
(D) $\left[\frac{7}{3}, \infty\right)$

Q14 If the roots of the equation $x^2-2ax+a^2+a-3=0$ are less than 3 then
(A) $a<2$
(B) $2 \leq a \leq 3$
(C) $3<a \leq 4$
(D) $a>4$

Q15 Let α, β be the roots of the quadratic equation $x^2+\sqrt{6}x+3=0$. Then $\frac{\alpha^{23}+\beta^{23}+\alpha^{14}+\beta^{14}}{\alpha^{15}+\beta^{15}+\alpha^{10}+\beta^{10}}$ is equal to
(A) 729 (B) 81
(C) 72 (D) 9

Q16 Let α and β be the roots of $x^2-6x-2=0$, with $\alpha>\beta$. If $a_n=\alpha^n-\beta^n$ for $n \geq 1$, then the value of $\frac{a_{10}-2a_8}{2a_9}$ is
(A) 1 (B) 2
(C) 3 (D) 4

Q17 Let α, β, γ be the three roots of the equation $x^3+bx+c=0$. If $\beta\gamma=1=-\alpha$, then $b^3+2c^3-3\alpha^3-6\beta^3-8\gamma 3$ is equal to
(A) $\frac{155}{8}$
(B) 21
(C) $\frac{169}{8}$
(D) 19

Q18 Let S be the set of postive integral values of a for which $\frac{ax^2+2(a+1)x+9a+4}{x^2-8x+32}<0, \forall x \in R$. Then, the number of elements in S is :
(A) 0 (B) ∞
(C) 1 (D) 3

Q19 Consider the polynomial $f(x)=1+2x+3x^2+4x^3$. Let s be the sum of all distinct real roots of $f(x)$ and let $t=|s|$, real number s lies in the interval
(A) $\left(-\frac{1}{4}, 0\right)$
(B) $\left(-11, \frac{3}{4}\right)$
(C) $\left(-\frac{3}{4},-\frac{1}{2}\right)$
(D) $\left(0, \frac{1}{4}\right)$

Q20 If $f(x)=x^2+2bx+2c^2$ and $g(x)=-x^2-2cx+b^2$ are such that min $f(x)>\max g(x)$, then the relation between b and c, is
(A) no relation
(B) $0<c<b/2$
(C) $c^2<2b$
(D) $c^2>2b^2$

Q21 If $\cos\alpha, \cos\beta$ and $\cos\gamma$ are the roots of the equation
$9x^3 - 9x^2 - x + 1 = 0; \alpha, \beta, \gamma \in [0, \pi]$ then the radius of the circle whose centre is $(\Sigma\alpha, \Sigma\cos\alpha)$ and passing through $\left(2\sin^{-1}(\tan\pi/4), 4\right)$ is:

(A) 2 (B) 3
(C) 4 (D) 5

Q22 The number of integral values of m for which the equation
$\left(1+m^2\right)x^2 - 2(1+3m)x + (1+8m) = 0$
has no real roots is :

(A) 2
(B) Infinitely many
(C) 1
(D) 3

Q23 Given that, for all $x \in R$, the expression $\frac{x^2-2x+4}{x^2+2x+4}$ lies between $\frac{1}{3}$ and 3 , the values between which the expression $\frac{9\cdot 3^{2x}+6\cdot 3^x+4}{9\cdot 3^{2x}-6\cdot 3^x+4}$ lies, are

(A) -3 and 1
(B) $\frac{3}{2}$ and 2
(C) -1 and 1
(D) 0 and 2

Q24 Let α, β, γ are roots of the equation
$x^3 + x^2(3\sin\theta) + 4x\cos\theta - 1 = 0$, where $\theta \in R$, then maximum value of $(1-\alpha)(1-\beta)(1-\gamma)$ is:

(A) 1 (B) 3
(C) 4 (D) 5

Q25 If the two equations $x^2 - cx + d = 0$ and $x^2 - ax + b = 0$ have one common root and the second has equal roots, then $2(b+d)$ is equal to

(A) 0 (B) $a+c$
(C) ac (D) $-ac$

Answer Key

Q1	(C)
Q2	(D)
Q3	(C)
Q4	(B)
Q5	(B)
Q6	(D)
Q7	(A)
Q8	(B)
Q9	(A)
Q10	(B)
Q11	(B)
Q12	(B)
Q13	(D)
Q14	(A)
Q15	(B)
Q16	(C)
Q17	(D)
Q18	(A)
Q19	(C)
Q20	(D)
Q21	(B)
Q22	(B)
Q23	(B)
Q24	(D)
Q25	(C)