PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. One real root of the equation $x^3 - 7x^2 + 14x - 8 = 0$ is ——————.

   (a) −2   (b) $\dfrac{1}{2}$

   (c) $-\dfrac{1}{2}$ (d) 2

2. If the equation $x^3 - 4x^2 + 4x - 16 = 0$ has two roots $2i$ and $-2i$ then, the other root is ——————.

   (a) $1 + i$ (b) $1 - i$

   (c) $2 - i$ (d) 4

3. The sum of the roots of the equation $x^4 - ax^3 + bx^2 - cx + d = 0$ is ——————.

   (a) $\dfrac{-b}{a}$ (b) $\dfrac{b}{a}$

   (c) a (d) $-a$

4. If a is a root of $x^4 - 2x^3 + 6x^2 + 2x - 1 = 0$ then ——————.

   (a) $-a$ is also a root   (b) $\dfrac{1}{a}$ is also a root

   (c) 1 is also a root   (d) none of the above

5. When the roots of the equation $3x^3 - 10x^2 + 9x + 2 = 0$ are multiplied by 3, the transformed equation is ——————

   (a) $3x^3 - 100x^2 + 900x + 2000 = 0$

   (b) $27x^3 - 90x^2 + 27x + 2 = 0$

   (c) $3x^3 - 30x^2 + 81x + 54 = 0$

   (d) $9x^3 - 30x^2 + 27x + 6 = 0$

6. To remove the second term of $x^4 - 12x^3 + 48x^2 - 72x + 35 = 0$ the roots are to be diminished by —————.

   (a) 1   (b) 2

   (c) 3   (d) −1

7. One real root of $x^3 - 6x - 13 = 0$ lies between —————.

   (a) 0 and 1   (b) 1 and 2

   (c) 3 and 4   (d) −1 and 0

8. If $f(x)$ is a polynomial of degree n then the equation $f'(x) = 0$ has —————.

   (a) n roots   (b) $n - 1$ roots

   (c) $n + 1$ roots   (d) $n - 2$ roots

9. One method of solving a biquadratic equation is —————.

   (a) Cardon's method   (b) Newton's method

   (c) Ferrarils method (d) Lagrange's method

10. Cardon's standard form of the cubic equation $a_0 x^3 + 3a_1 x^2 + 3a_2 x + a_3 = 0$ is —————.

   (a) $z^3 + 3Hz + G = 0$

   (b) $z^3 + Hz + G = 0$

   (c) $a_0 x^3 + a_1 x^2 + a_2 x + a_3 = 0$

   (d) $z^3 + 3Hz^2 + G = 0$

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) If one root of the equation $2x^3 - 11x^2 + 38x - 39 = 0$ is $2 - 3i$, solve the equation.

   Or

   (b) If the product of two roots of $x^4 + px^3 + qx^2 + rx + 5 = 0$ is equal to the product of the other two. Show that, $r^2 = p^2 s$.

12. (a) Show that the sum of the 6th powers of the roots of $x^7 - x^4 + 1 = 0$ is z.

   Or

   (b) Show that $4(x^2 - x + 1)^3 = 27x^2(x - 1)^2$ is a standard reciprocal equation.

13. (a) Diminish the roots of the equation $x^3 + x^2 + x - 100 = 0$ by 4.

   Or

   (b) Find the nature of the roots of the equation $4x^3 - 21x^2 + 18x + 20 = 0$.

Nesamony Memorial Christian College, Marthandam

14. (a) Solve $4x^3 - 12x^2 - 15x - 4 = 0$ given that it has a double root.

Or

(b) Find correct to 2 places of decimals the root of the equation $x^4 - 3x + 1 = 0$ that lies between 1 and 2.

15. (a) Solve $x^4 - 10x^3 + 35x^2 - 50x + 24 = 0$ using Ferrari's method.

Or

(b) Solve $2x^3 + 3x^2 + 3x + 1 = 0$.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Solve the equation

$x^5 - x^4 + 8x^2 - 9x - 15 = 0$ if $\sqrt{3}$ and $1 - 2i$ are two of its roots.

Or

(b) Show that the roots of the equation $px^3 + qx^2 + rx + s = 0$ are in arithmetic progression iff $2q^3 + 27p^3s = 9pqr$.

17. (a) Find (i) $\Sigma \alpha^2$ (ii) $\Sigma \alpha^{-2}$ for the equation $x^4 - x^3 - 19x^2 + 49x - 30 = 0$.

Or

(b) Solve $6x^6 - 5x^5 - 44x^4 + 44x^2 + 5x - 6 = 0$.

18. (a) Solve $x^4 - 12x^3 + 48x^2 - 72x + 35 = 0$ by removing the second term.

Or

(b) Find the nature of the roots of $x^4 + 4x^3 - 20x^2 + 10 = 0$.

19. (a) Find the number and position of the real root of $x^6 - 2x^2 + 3x - 4 = 0$.

Or

(b) Find the positive root of the equation $x^3 - 2x^2 - 3x - 4 = 0$ correct to three places of decimals.

20. (a) Solve by Cardan's method $x^3 - 3x + 1 = 0$.

Or

(b) Solve $4x^4 + 8x^3 + 12x^2 + 4x + 5 = 0$ using Ferrari's method.

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Page 5   Code No. : 41141 E

Page 6   Code No. : 41141 E

Nesamony Memorial Christian College, Marthandam