

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 948

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Unique Paper Code : 2352202002

Name of the Paper : Theory of Equations and Symmetries

Name of the Course : B.A. (Prog.) with Mathematics – DSC

Semester : III

Duration : 3 Hours

Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt all questions by selecting two parts from each question.
3. All questions carry equal marks.
4. Use of Calculator not allowed.

1. (a) Solve the equation $x^3 - 13x^2 + 15x + 189 = 0$, given that one of the roots exceeds another by 2.

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- (b) Find the nature of the roots of the equation, using Descartes's Rule of signs

$$x^4 - 2x^3 - 1 = 0.$$

- (c) Find a necessary condition for the roots of the equation $x^3 - px^2 + qx - r = 0$ to be in harmonic progression.

2. (a) Using De Moivre's Theorem, show that

$$(1 + \cos\theta + i \sin\theta)^n + (1 + \cos\theta - i \sin\theta)^n = 2^{n+1} \cos^n(\theta/2) \cos n(\theta/2)$$

- (b) Find all the values of

$$\left(\frac{1}{2} + i \frac{\sqrt{3}}{2} \right)^{\frac{3}{4}}.$$

- (c) Solve the equation $x^7 - 1 = 0$.

3. (a) Solve the following cubic equation by Cardon's Method

$$y^3 - 9y + 28 = 0.$$

- (b) Find the equation whose roots are diminished by 3 the roots of $x^4 - 7x^3 + 3x^2 - 11x + 17 = 0$.

- (c) Solve the following biquadratic equation by Descartes Method

$$z^4 - 6z^2 - 16z - 15 = 0.$$

4. (a) Find the solution of equation $y^3 - 15y - 126 = 0$ by Cardon's Method.

- (b) Find the equation whose roots are the reciprocals of the roots of the equation

$$x^6 + \frac{3}{4}x^5 - \frac{12}{5}x^4 + \frac{12}{5}x^2 - \frac{3}{4}x - 1 = 0.$$

- (c) Find the solution of equation $z^4 + 3z^2 + 2z + 12 = 0$ by Descartes Method.

5. (a) Find the equation whose roots are 6 times the roots of $x^3 + 3x^2 - 8x + 5 = 0$.

- (b) If α , β and γ are the roots of the equation $x^3 + 2x^2 - 3x - 1 = 0$, then find the value of $\alpha^{-3} + \beta^{-3} + \gamma^{-3}$.

- (c) Find an equation whose roots are the reciprocals of the roots of the equation

$$x^4 - 3x^3 + 7x^2 - 8x + 2 = 0.$$

6. (a) If α , β and γ are the roots of the equation $x^3 - px^2 + qx - r = 0$. Find

(i) $\sum \alpha^2$

(ii) $\sum \alpha^2 \beta$

- (b) If α , β , γ are the roots of $x^3 + qx + r = 0$, find the value of $\sum(\beta + \gamma)^2$.

- (c) If α , β , γ and δ are the roots of $x^4 + px^3 + qx^2 + rx + s = 0$, find the value of

$$\sum \frac{1}{\alpha}.$$