

[This question paper contains 2 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 6567
Unique Paper Code : 2352202002
Name of the Paper : Theory of Equations and Symmetries
Type of the Paper : DSC
Semester : III
Programme : BACHELOR OF ARTS (PROGRAMME) WITH
MATHEMATICS AS MAJOR

Duration: 3 Hours

Maximum Marks: 90

Instruction for Candidates:

1. Write your Roll No. on the top immediately on receipt of this question paper.
 2. Attempt any **two** parts of each question.
 3. Each part carries **7.5** marks.
 4. Use of Calculator is **not** allowed.
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1. (a) Find the quotient and remainder when $x^4 - 3x^3 + 3x^2 - 3x + 2$ is divided by $x^2 - 3x + 2$, using the synthetic division.
(b) Find the nature of the roots of the equation $x^4 + 3x - 1 = 0$, using Descartes rule of signs.
(c) Find the equation of the lowest degree with real coefficients having $1 + 2i$ and $3 - i$ as two its roots.
 2. (a) State and prove De-Moivre's Theorem for an integral index.
(b) Prove that
$$\cos(6\theta) + 6 \cos(4\theta) + 15 \cos(2\theta) + 10 = 32 (\cos \theta)^6.$$

(c) Solve the equation $z^4 + 1 = 0$, using De-moivre's Theorem for a rational index.
 3. (a) Solve the equation $x^3 - 6x - 9 = 0$, using Cardan's method.
(b) Find the necessary condition for the roots of the equation $x^3 - px^2 + qx - r = 0$ to be in the geometric progression.
(c) Solve the equation $x^4 - 6x^2 - 16x - 15 = 0$ by the method of Descartes.
 4. (a) Solve the equation $2x^3 + 3x^2 + 3x + 1 = 0$ using Cardan's method.
(b) Solve the equation $2x^3 + x^2 - 7x - 6 = 0$, given that the difference of two of its roots is 3.
(c) Find the solution of the equation $x^4 - 10x^2 - 20x - 16 = 0$ by Descartes Method.

5. (a) If α, β, γ are the roots of the equation

$$2x^3 + 7x^2 + x + 8 = 0,$$

then find the value of $\alpha^2 + \beta^2 + \gamma^2$.

(b) If $\alpha, \beta, \gamma, \delta$ be the roots of equation $x^4 + px^3 + qx^2 + rx + s = 0$, then find the value of $\sum \alpha^2 \beta$.

(c) If α, β, γ be the roots of equation $x^3 - px^2 + qx - r = 0$, then find the value of $\sum \frac{\alpha}{\beta}$.

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

(b) If α, β, γ be the roots of equation

$$x^3 + 4x^2 + 2x + 3 = 0,$$

then find the value of $\sum (\beta + \gamma)^2$.

(c) Use Newton's formulae to find the value of s_4 , for the cubic equation

$$x^3 + a_1x^2 + a_2x + a_3 = 0;$$

where $s_k = \sum (\alpha_1)^k, \alpha_1, \alpha_2, \alpha_3$ be roots of the given cubic equation.