[Total No. of (i) Printed Pages 4 (ii) Questions 8]

Sub Code : 0147 (1048) **Exam Code :** 0002

Exam : B.A./B.Sc. (General), 2nd Semester

Subject : Mathematics

Paper : Paper-III : Theory of Equations

Time : 3 Hours ***Maximum Marks : 30***

Note: Attempt **five** questions in all selecting at least **two** questions from each unit. **All** questions carry equal marks.

UNIT-I

1. (a) Find a polynomial of least degree having -2,1,3 as its zeros and having value -8 at x = 2.

(b) Find g.c.d of two polynomials

$f(x) = x^3 + 6x^2 + 11x + 6$ and $g(x) = x^2 + 7x + 10$.
Express the g.c.d as $a(x)\, f(x) + b(x)\, g(x)$.

2. (a) Solve the equation $x^4 + 2x^3 - 2x - 1 = 0$ given that it has multiple roots.

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(b) Prove that the complex roots of a real polynomial equation occur in conjugate pairs.

3. (a) Solve the equation $x^4 + 2x^3 - 21x^2 - 22x + 40 = 0$ given that its roots are in A.P.

(b) Solve the equation $x^4 - 8x^3 + 14x^2 + 8x - 15 = 0$ given that two of its roots are equal in magnitude but opposite in sign.

4. (a) Transform the equation $2x^3 - 9x^2 + 13x - 6 = 0$ into one in which second term is missing and hence solve the equation.

(b) If α, β, γ are roots of $2x^3 + x^2 + x + 1 = 0$ form an equation whose roots are

$$\frac{1}{\beta^2}+\frac{1}{\gamma^2}-\frac{1}{\alpha^2}, \frac{1}{\gamma^2}+\frac{1}{\alpha^2}-\frac{1}{\beta^2}, \frac{1}{\alpha^2}+\frac{1}{\beta^2}-\frac{1}{\gamma^2}$$

UNIT-II

5. (a) Find the equation whose roots are squared differences of the roots of the equation $x^3 + 6x^2 + 9x + 4 = 0$. Hence show that given equation has a double roots.

(b) Let $f(x) = a_0 + a_1 x + a_2 x^2 + \ldots\ldots + a_n x^n$ be a real polynomial of degree n and $a_0 \neq 0$. Let r and s be the number of variations in sign of f(x) and f(-x) respectively. Show that n-r-s is even.

6. (a) Show that the real roots of the equation $x^4 - 10x^3 - 13x^2 + 60x + 65 = 0$ lie between -4 and 12.

(b) Use Newton's method of divisor to find the integral roots of the equation :

$3x^4 - 23x^3 + 35x^2 + 31x - 30 = 0$

7. (a) Use Cardon's method to solve

$x^3 + x^2 - 16x + 20 = 0$

(b) For the equation $x^3 - 6x^2 - 6x - 14 = 0$, find $G^2 + 4H^3$ and hence discuss the nature of roots.

8. (a) Solve the biquadratic $x^4 - 6x^3 + 3x^2 + 22x - 6 = 0$ by Descarte's Method.

(b) Solve by Ferrori's Method, the equation

$2x^4 + 6x^3 - 3x^2 + 2 = 0$