[Total No. of  (i)  Printed Pages 3  (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.

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

   (b) If $\alpha, \beta, \gamma$ are roots of $2x^3 + x^2 + x + 1 = 0$ form an equation whose roots are
   $$\frac{1}{\beta^2} + \frac{1}{\gamma^2} - \frac{1}{\alpha^2}, \quad \frac{1}{\gamma^2} + \frac{1}{\alpha^2} - \frac{1}{\beta^2}, \quad \frac{1}{\alpha^2} + \frac{1}{\beta^2} - \frac{1}{\gamma^2}$$

## 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.

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(b) Let $f(x) = a_0 + a_1 x + a_2 x^2 + \text{.........} + an\ x^n$ be a real polynomial of degree n and $a_0 = 0$. 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
   $2x^4 + 6x^3 - 3x^2 + 2 = 0$

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