Roll No. | | | | | | | | | | | | | **Total No. of Pages : 02**

Total No. of Questions : 09

B.Sc. - Honours (Mathematics) (Sem.–1)

ALGEBRA

Subject Code : BSHM-102-22

M.Code : 92789

Date of Examination : 23-01-23

Time : 3 Hrs. **Max. Marks : 60**

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION - B & C have FOUR questions each.**
3. **Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.**
4. **Select atleast TWO questions from SECTION - B & C.**

SECTION-A

1. a) State Remainder and Factor theorem.

b) Reduce in echelon form: $A = \begin{pmatrix} 1 & 3 & 2 \\ 1 & 6 & 1 \\ 2 & 3 & 6 \end{pmatrix}$.

c) Find the column rank of the matrix $A = \begin{pmatrix} 1 & 1 & 2 \\ 1 & 4 & 3 \\ 3 & 3 & 6 \end{pmatrix}$.

d) Check the consistency of the system of equations: $x + 2y = 0$ and $2x - y = 0$.

e) Check whether $x = 1$ is a root of the equation $x^3 + x^2 - x - 1 = 0$ using synthetic division.

f) Use synthetic division to find the remainder when $x^5 - 4x^4 - 7x^3 + 11x - 13$ is divided by $x - 5$.

g) Examine the maximum number of negative real roots of the polynomial equation $2x^5 - x^4 - 3x^2 + 5 = 0$.

h) State Strum's theorem.

i) Check whether the function $f(x, y, z) = x + y^2 + z^3$ is a symmetric function or not.

j) State the theorem on imaginary roots of a polynomial with real coefficients.

SECTION-B

2. a) If α, β, γ be the roots of $(a - x)(b - x)(c - x) + 1 = 0$, then find the equation whose roots are a, b, c.

   b) Find the polar representation of $z = 1 + i$.

3. State and prove Fundamental theorem of algebra.

4. State and Prove Rational root theorem.

5. a) The roots of the equation $x^3 - 12x^2 + 44x - 48 = 0$ are in A.P. Find the roots.

   b) Solve the equation $4x^3 - 4x^2 - 15x + 18 = 0$, given that two of its roots are equal.

SECTION-C

6. Solve the system of equations: $x - y + 3z = 3$; $2x + 3y + z = 2$; $3x + 2y + 4z = 5$ using Gauss Elimination method.

7. Solve the cubic equation: $x^3 - 6x^2 - 6x - 7 = 0$ using Cardano's method.

8. Find the inverse of the matrix $A = \begin{pmatrix} 1 & 2 & 3 \\ 3 & -2 & 1 \\ 4 & 1 & 1 \end{pmatrix}$ using Gauss Jordon method.

9. Comment on the number of distinct root of the polynomial $x^3 - x - 6 = 0$ using strum's theorem on symmetric polynomials.

NOTE : Disclosure of Identity by writing Mobile No. or Marking of passing request on any paper of Answer Sheet will lead to UMC against the Student.