BCA (Honours) 1st Semester Examination, 2021
Subject: Computer Application
Paper Name: Mathematics-I
Paper Code: BCA-103

Time: 3 Hours **Full Marks: 80**

Answer any six questions ***6X5=30***

1. (i) Find the H.C.F. & L.C.M. of the numbers 12, 20, 140 using set theory. 5
   (ii) Remove the fractional coefficients of the equation: $(2x^3 - \frac{3}{2}x^2 - \frac{1}{8}x + \frac{3}{16})$. 5
   (iii) If $\sqrt[3]{x+iy} = a + ib$, then show that $\frac{x}{a} + \frac{y}{b} = 4(a^2 - b^2)$. 5
   (iv) Prove that the product of a matrix and its transpose is a symmetric matrix. 5
   (v) Remove the second term of the equation $x^3 + 6x^2 + 12x - 19$=0 and solve the given equation. 5
   (vi) Express in the form$A + iB$: $\frac{z+1}{z-1}$ where $z = x + iy$ 5
   (vii) If α, β, γ be the roots of the equation $x^3 + px^2 + qx + r = 0$, find the equation whose roots are $(\beta+\gamma), (\gamma+\alpha), (\alpha+\beta)$ 5
   (viii) Find the equation of parabola whose focus is (2,3) and the directrix is 4x-3y+1=0. 5
   (ix) Prove the finite integral domain is a field. 5

Answer any five questions ***5X10=50***

2. (a) If pair of lines $x^2 - 2pxy - y^2 = 0$ and $x^2 - 2qxy - y^2 = 0$ is such that each pair bisects the angles between the other pair, prove that pq+1=0. 10
   (b) Solve by Matrix method: $x + y + z = 8,\ x - y + 2z = 6,\ 3x + 5y - 7z = 14$ 10
   (c) Reduce the equation $4x^2 + 4xy + y^2 - 4x - 2y + a = 0$ to the canonical form and determine the type of the conic represented by it for different values of a. 10
   (d) (i) If A=$\begin{pmatrix} 1 & 2 \\ 4 & 3 \end{pmatrix}$, find the value of A^2 (ii) Find the rank of the matrix: $\begin{bmatrix} 1 & 2 & 3 \\ 3 & 4 & 5 \\ 4 & 6 & 8 \end{bmatrix}$ (4+6)
   (e) If $A = \begin{bmatrix} 2 & 5 & 3 \\ 3 & 1 & 2 \\ 1 & 2 & -1 \end{bmatrix}$, Find adjoint and the inverse matrices. 10
   (f) If the vectors $\vec{a} + \vec{b}, \vec{b}+\vec{c}, \vec{c} + \vec{d}$ are coplanar, then show that the vectors $\vec{a}, \vec{b}, \vec{c}$ are coplanar. 10
   (g) Find the locus of the middle point of the conic $\frac{l}{r} = 1 + e\cos\theta$. 10
   (h) (i)Find whether or not the relations $R_1\, and\, R_2$ in the set A= {1, 2, 3, 4} are reflexive, symmetric, anti-symmetric, transitive (i) $R_1 = \{(1,1), (1,2)\}$ (ii) R_2={(1,1), (2,2), (4,4)}.
   (ii) Show that the set $\{\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}, \begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}, \begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix}, \begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}\}$ forms an abelian group under matrix multiplication. (5+5)