

**B.A. (H) ENGLISH II YEAR (ANNUAL MODE)**

DCC-Mathematics: Algebra and Calculus

(Code: B-823)

पूर्णांक : 100

M.M. : 100

*Attempt any two questions in all.*

*All questions carry equal marks.*

**Note :** *The maximum marks printed on the question paper are applicable for the students. These marks will, however be scaled down proportionately in respect of the students of regular colleges, at the time of posting of awards for compilation of result.*

Q.1. (a) Show that the set of all matrices of the form  $\begin{bmatrix} a & b \\ -b & -a \end{bmatrix}$  where  $a, b \in \mathbb{R}$ , is a vector space over  $\mathbb{R}$ , with respect to matrix addition and scalar multiplication.

(b) Find the inverse of the matrix  $\begin{bmatrix} 3 & -15 & 5 \\ -1 & 6 & -2 \\ 1 & -5 & 2 \end{bmatrix}$  by calculating its adjoint.

Q.2. (a) A double ordinate of the parabola  $y^2 = 4ax$  is of the length  $8a$ . Prove that the lines joining the vertex to the two ends of the ordinate are at right angles.

(b) Trace the curve:

$$9x^2 + 24xy + 16y^2 - 2x + 14y + 1 = 0$$

Q.3. (a) Discuss the continuity of the following real valued function in the interval  $[0, 2]$

$$f(x) = \begin{cases} 0 & 0 \leq x < \frac{1}{3} \\ 3x-1, & \frac{1}{3} \leq x < \frac{2}{3} \\ 1, & \frac{2}{3} \leq x < \frac{4}{3} \\ 5-3x, & \frac{4}{3} \leq x < \frac{5}{3} \\ 0, & \frac{5}{3} \leq x < 2 \end{cases}$$

(b) Let  $f(x) = |x - 1| + |x + 1|$ ,  $\forall x \in \mathbb{R}$ , show that  $f$  is differentiable at all points in  $\mathbb{R}$ , except at  $x = 1$  and  $x = -1$ .

Q.4. (a) Evaluate

(i)  $\int_0^{\pi/2} \sin^6 \cos^8 x \, dx$

(ii)  $\int_0^{\pi/2} \frac{dx}{1+2\cos x}$

(b) Show that  $\int_0^{\pi/2} \frac{\sqrt{\sin x} \, dx}{\sqrt{\sin x} + \sqrt{\cos x}} = \frac{\pi}{4}$