Roll No. 100

Subject Code—2071

M.C.A. (First Year) EXAMINATION

(Five Years Integrated Course)

MCA-103

MATHEMATICS–I

Time : 3 *Hours* *Maximum Marks* : 100

Note : Attempt any *Five* questions. All questions carry equal marks.

1. (a) Solve for x :

$$\sqrt{x+21}+\sqrt{x+5}=\sqrt{6x+40}$$

(b) Solve the equations :

$$x+y=10,\ \sqrt{\frac{x}{y}}+\sqrt{\frac{y}{x}}=\frac{10}{3}$$

(c) Solve, using Cramer's rule :

$$x - 3y + z = 2$$
$$3x + y + z = 6$$
$$5x + y + 3z = 3$$

2. (a) Define transpose of a matrix. If :

$$A = \begin{bmatrix} 3 & -2 \\ 4 & -2 \end{bmatrix} \text{ and } I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix},$$

find k such that $A^2 = kA - 2I$.

(b) Find the inverse of the matrix :

$$\begin{bmatrix} 1 & -1 & 2 \\ 0 & 2 & -3 \\ 3 & -2 & 4 \end{bmatrix}$$

3. (a) Prove that :

$$\sqrt{\frac{1+\cos A}{1-\cos A}} = \operatorname{cosec} A + \cot A$$

(b) Find the value of x from the equation :

$$\tan(90^\circ + A)\sin A + \operatorname{cosec}(90^\circ + A) + x \cot(90^\circ + A) = 0$$

(c) Show that :

$$\cos 20^\circ \cos 30^\circ \cos 40^\circ \cos 80^\circ = \frac{\sqrt{3}}{16}$$

4. (a) A and B are two points (3, 4) and (5, –2). Find a point P such that PA = PB and $\Delta PAB = 10$.

(b) Find the equation of the line passing through (–6, –5) and perpendicular to the line joining (1, 3) and (5, 7).

(c) A straight line passes through the point (2, 3) and the portion of the line intercepted between the axes is bisected at this point. Find the equation of the line.

5. (a) Find $\frac{dy}{dx}$ if $xy + xe^{-y} + ye^{x} = x^{2}$.

(b) Find nth derivative of $e^{x}.\log x$.

(c) Evaluate :

$$\int \frac{dx}{(x+1)(2x+1)}$$

6. (a) Solve the differential equation :

$$(x+y+1)^{2}\frac{dy}{dx} = 1$$

(b) Solve the differential equation :

$$\frac{dy}{dx} + x \sin 2y = x^3 \cos^2 y$$

7. (a) Find mean, median and quartiles Q_1 and Q_3 from the following data :

Marks	No. of Students
20–30	7
30–40	23
40–50	0
50–60	22
60–70	11
70–80	7

(b) The following are scores made by two batsmen A and B in a series of innings :

A : 12 115 6 73 7 19 119 36 84 29

B : 47 12 76 42 4 51 37 48 13 0

(i) Who is the better run getter ?

(ii) Who is more consistent ?

8. (a) Two urns contain 1 white, 6 red and 4 white, 3 red balls. One of the urn is selected at random and a ball is drawn from it. Find (i) The probability of drawing a white ball. (ii) The probability of drawing the ball from the first urn if the ball drawn is white.

(b) Explain Binomial distribution. Obtain its mean and variance.

(c) Fit a straight line that best fits the data :

x :	1	2	3	4	5
y :	14	27	40	55	68