Roll No. .....

Subject Code—6788

M.C.A. (First Year) EXAMINATION

(5 Years Integrated Course)

(Main)

MCA-103

MATHEMATICS-1

Time : 3 Hours *Maximum Marks : 70*

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

1. (a) Solve for x :

$$\sqrt{2x+6}+\sqrt{x+4}=\sqrt{8x+9}$$

(b) Solve the equation :

$$\sqrt{\frac{x}{4}}+\sqrt{\frac{y}{x}}=\frac{5}{2},\ x+4=10$$

(c) Solve by using Cramer's rule :

$$10x_1 + 2x_2 + x_3 = 59$$

$$x_1 + 8x_2 + 2x_3 = -4$$

$$2x_1 - x_2 + 20x_3 = 74$$

2. (a) Find the adjoint of the following matrix :

$$\begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$$

(b) Compute the inverse of the following :

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

3. (a) Prove that :

$$\sqrt{\frac{1+\sin A}{1-\sin A}} = \sec A + \tan A$$

(b) Prove that :

$$\tan 75^\circ - \tan 30^\circ - \tan^\circ 75 \tan 30^\circ = 1$$

(c) Find x from the following equation :

$$\operatorname{cosec}(90^\circ+\theta) - x\sin(90^\circ-\theta)\tan(180^\circ+\theta) = \sin(90^\circ+\theta)$$

4. (a) Prove that the point (2, –2), (–2, 1), (5, 2) are the vertices of a right angled triangle. Find the length of the hypotenuse.

(b) Find the area of the triangle whose vertices are (2, –2), (–2, 1) and (5, 2).

(c) A line passes through (3, 4) and the sum of it intercepts on the axes is 14. Find its equation.

5. (a) Evaluate the following limit :

$$\lim_{x \to 1}\left(\frac{x^3-1}{x^2-1}\right).$$

(b) Find $\frac{dy}{dx}$ when :

$$ax^2 + by^2 + 2hxy + 2gx + 2by + c = 0$$

(c) Find the third derivative of x^2e^x.

6. Evaluate the following integral :

(a) $\int \frac{(\log x)^3}{x} dx$

(b) $\int \frac{x^3 \, dx}{\left(x^2 - x - 2\right)}$

7. (a) Solve the following differential equation :

$$\frac{dy}{dx} = \frac{3e^{2x} + 3e^{4x}}{e^x + e^{-x}}$$

(b) Calculate the A.M. from the following data :

Marks	No. of Students
0–10	5
10–30	7
30–40	15
40–50	8
50–80	3
80–100	2

8. (a) Calculate the S.D. and coefficient of variation for the following frequency distribution :

Class	Frequency
4–8	11
8–12	13
12–16	16
16–20	14
20–24	14
24–28	9
28–32	17
32–36	6
36–40	4

(b) State and prove Baye's theorem.