Subject Code—6794-X

M.C.A. (First Year) EXAMINATION

(5 Years Integrated Course)

(Re-appear Batch Prior to 2009)

MCA-103

MATHEMATICS-1

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

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 :

$$\csc(90°+\theta) - x\sin(90°-\theta)\tan(180°+\theta)$$
$$= \sin(90°+\theta)$$

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 :

$$\underset{x \to 1}{\text{Lt}}\left(\frac{x^3 - 1}{x^2 - 1}\right)$$

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

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

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

6. Evaluate the following integral :

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

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

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.