Subject Code—4266

M.C.A. (First Year) EXAMINATION

June, 2006

(5 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) Find the value of x :

$$\sqrt{3x^2 - 7x - 30} = (x + 5) - \sqrt{2x^2 - 7x - 5}$$

(b) Solve the following equations by Cramer's rule :

$$x + y + z = 9$$
$$2x + 5y + 7z = 52$$
$$2x + y - z = 0$$

2. (a) If matrices $A = \begin{bmatrix} 2 & 3 & 1 \\ 0 & 2 & -2 \end{bmatrix}$ and

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

find product AB and BA. Is AB = BA ?

(b) Define transpose of a matrix and find inverse of the matrix :

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 3 & 1 & 2 \\ 2 & 3 & 1 \end{bmatrix}$$

3. (a) Prove that :

$$2(\sin^6 x + \cos^6 x) - 3(\sin^4 x + \cos^4 x) + 1 = 0$$

(b) If $5 \tan \theta = 4$, find the value of $\dfrac{5 \sin \theta - 3 \cos \theta}{\sin \theta + 2 \cos \theta}$.

(c) Find the value of sin 15° and tan 15°.

4. (a) If the points $(x, -1)$, $(2, 1)$ and $(4, 5)$ are on a straight line, then find the value of x.

(b) Find the locus of a point (x, y) which moves so that its distance from $(4, 0)$ and y-axis are equal.

(c) Find the equation of a straight line passing through $(3, 4)$ and having sum of intercepts as 14.

5. (a) If :

$$y = (a \sin x + b \cos x)$$

find $\frac{d^2y}{dx^2}$.

(b) Find nth derivative of $y = e^x . \log x$.

(c) Evaluate :

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

6. Solve the following differential equations :

(a) $ydx - xdy = xy\,dx$

(b) $(x + y)\,dx + (x - y)\,dy = 0$

(c) $\cos^2 x \frac{dy}{dx} + y = \tan x$

7. (a) Find Mean and Median from the following data :

Marks	No. of Students
0–10	3
10–20	5
20–30	7
30–40	10
40–50	12
50–60	15
60–70	12
70–80	6
80–90	2
90–100	8

(b) Compute standard deviation from the data :

Marks	No. of Students
0–10	3
10–20	16
20–30	26
30–40	31
40–50	16
50–60	8

8. (a) State and prove Baye's theorem for probability.

(b) Find first two moments of Binomial distribution. Hence find mean and variance.

(c) Calculate coefficient of correlation from the following data :

x	:	1	2	3	4	5
y	:	2	5	3	8	7