This question paper contains 4+1 printed pages]

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B.A. (Hons.)/II   **D**

DISCIPLINE CENTRED CONCURRENT COURSE

Maths other than Economics

(Algebra and Calculus)

(Admissions of 2005 and onwards)

Time : 2 Hours   *Maximum Marks : 38*

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt any *two* questions from each Section.

Section A

1.   (*a*)   If $A = \begin{bmatrix} 3 & 2 \\ 4 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} a & b \\ 3 & 5 \end{bmatrix}$, find a and b

such that AB = BA. Compute 3A + 5B.   4

(b)   Given $A = \begin{bmatrix} 2 & 8 \\ 3 & 0 \\ 5 & 1 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 0 \\ 3 & 8 \end{bmatrix}$. Calculate AB. Can

you calculate BA ? Explain your answer.   3

2.   (a)   Find the inverse of the matrix

$$A = \begin{bmatrix} 4 & -2 & 1 \\ 7 & 3 & 3 \\ 2 & 0 & 1 \end{bmatrix}.$$ 3

(b)   Solve the following system of equations by Cramer's

rule :

$$x - 4y - z = 11,$$

$$2x - 5y + 2z = 39,$$

$$-3x + 2y + z = 1.$$ 4

3.   (a)   Find the length of major and minor axes, coordinates

of foci, vertices and eccentricity and sketch the graph

of ellipse $4x^2 + 25y^2 = 100$.   4

(b) Find the centre and radius of the given circle

$$x^2 + y^2 - x + 2y - 3 = 0.$$ 3

Section B

4. (a) If

$$y = \frac{\log x}{x},$$

find $\frac{dy}{dx}$. 3

(b) Examine the concavity of the following function :

$$f(x) = x^3 - 3x^2 + 3x - 3.$$ 3

5. (a) A function f is defined as,

$$f(x) = \begin{cases} x + 1, & \text{if } -1 \leq x < 0 \\ x, & \text{if } 0 \leq x < 1 \\ 2 - x, & \text{if } 1 \leq x < 2 \end{cases}$$

Show that it is discontinuous at $x = 0$ but is continuous

at $x = 1$. 3

(b)   Prove that the curve $3y = x^3 - 3x^2 - 9x + 11$ has

a maximum value at $x = -1$, a minimum value at

$x = 3$ and a point of inflection at $x = 1$.   3

6.   (a)   Verify Lagrange's Mean Value Theorem for the function

$f(x) = \sqrt{x^2 - 4}$ in [2, 4].   3

(b)   Obtain Maclaurin's series expansion of $f(x) = e^x$.   3

Section C

7.   (a)   Find :

$$\int x^2 \sin x^3 dx .$$ 3

(b)   Find the area of the region bounded by the curve

$y = x^2$, the x-axis and the lines $x = 2$ and $x = 3$.   3

8.   (a)   Find the general solution of the differential equation

$$\frac{dy}{dx} = \frac{x+1}{2-y}, y \neq 2 .$$ 3

(b) Evaluate :

$$\int x \cdot \log x \, dx.$$ 3

9. (a) Solve

$$\frac{dy}{dx} = x\sqrt{x^2 + 1},$$

given that $y = 6$ at $x = 0$. 3

(b) Given MR = 2 − 6x, where MR denote marginal revenue find revenue function R. 3