2012

ECONOMICS

(Major)

Paper : 3.1

(Elementary Mathematics for Economics)

Full Marks : 80

Time : 3 hours

The figures in the margin indicate full marks for the questions

1. Answer the following questions : 1×10=10

(a) If $A = \{1, 2, 3, 4, 5\}$ and $B = \{4, 5, 6, 7\}$, find $A \cup B$.

(b) Give an example of a finite set.

(c) Define a rational function with example.

(d) Define a column vector with example.

(e) Given that $A = \begin{bmatrix} 2 & 3 & 0 \\ 4 & 1 & 2 \end{bmatrix}_{2 \times 3}$. Find the transpose of A, i.e., A'.

(f) Define the rank of a matrix with example.

(g) Given that $y = e^{ax}$. Find $\frac{dy}{dx}$.

(h) For the function $z = x + ye^{-x}$, find $\frac{\partial z}{\partial y}$.

(i) Find $\int x^5 \, dx$.

(j) What total function will you obtain when you integrate the marginal propensity to consume (MPC) function?

2. Answer the following questions : 2×5=1

(a) Define a homogeneous function.

(b) Evaluate the limit of the function

$$\lim_{x \to 1} \frac{1 - x}{1 - x^2}$$

(c) Can you add $A = \begin{bmatrix} 3 & 2 \\ 0 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 9 & 3 \end{bmatrix}$? Justify your answer.

(d) Apply quotient rule to find the derivative of $y = \frac{\sqrt{x}}{x+1}$.

(e) Find the integral of the following :

$$\int\left(2x^2+\frac{4}{x}\right)dx$$

3. Answer briefly any *four* of the following : 5×4=20

(a) State when two matrices A and B are conformable for multiplication. Given that $A=\begin{bmatrix}2 & 3\\ 4 & 1\end{bmatrix}$ and $B=\begin{bmatrix}3 & 0\\ 4 & 2\end{bmatrix}$. Find AB. 2+3=5

(b) If $A=\begin{bmatrix}1 & 2\\ 2 & 1\end{bmatrix}$, show that $A^2-3I=2A$.

(c) State the conditions under which the function $y=f(x)$ will be continuous at $x=a$. Graphically, how can you make out whether a function is continuous or not? 3+2=5

(d) Find the partial derivatives of the function

$$y=f(x_1, x_2)=x_1^3+2x_1x_2^2+3x_2^2$$

(e) Obtain the first- and second-order derivative of the following function at $x=3$: 2½+2½=5

$$y=x^3-6x^2+9x-2$$

(f) Find the integral of $\int x^2\cdot e^x\,dx$.

4. Answer any *four* of the following : 10×4=40

(a) Solve the following equation system by matrix inversion :

$$2x_1 + x_2 + 3x_3 = 15$$
$$x_1 - 2x_2 + 5x_3 = 13$$
$$4x_1 + 3x_2 - x_3 = 11$$

(b) What is a determinant? Evaluate

$$|A| = \begin{vmatrix} 4 & 0 & 2 \\ 3 & 3 & 1 \\ 1 & 2 & 5 \end{vmatrix}$$

State two properties of determinants with example. 2+4+4=10

(c) State three basic assumptions of input-output analysis. Give the economic meaning of the element $a_{32} = 0 \cdot 35$ in an input coefficient matrix. Write the input coefficient matrix for an n industry economy. 3+2+5=10

(d) In a three-sector economy, the input coefficient matrix and final demand vector are as given below :

$$A = \begin{bmatrix} 0 \cdot 3 & 0 \cdot 2 & 0 \cdot 3 \\ 0 \cdot 1 & 0 \cdot 3 & 0 \cdot 4 \\ 0 \cdot 2 & 0 \cdot 3 & 0 \end{bmatrix} \text{ and } F = \begin{bmatrix} 500 \\ 700 \\ 600 \end{bmatrix}$$

Find the sectorial output X_1, X_2 and X_3.

(e) State and prove the product rule of differentiation. If $Y = (5 + 2x^2)(3x + 4x^2)$, using the product rule of differentiation, find $\frac{dy}{dx}$. 5+5=10

(f) (i) For the function

$$y = \log (ax^2 + bx + c)$$

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

(ii) If $xy = a$, show that

$$x \frac{d^2y}{dx^2} + 2 \frac{dy}{dx} = 0$$

5+5=10

(g) For the following functions, prove that $f_{xy} = f_{yx}$: 5+5=10

(i) $f(x, y) = 6x^3 + 5x^2y + xy^2 + 2y^2$

(ii) $f(x, y) = 5x_1x_2$

(h) (i) Find the definite integral :

$$\int_2^4 (8 + 7x)^2 \, dx$$

(ii) Given that the marginal cost function $MC = C'(Q) = 3Q + 1$, where Q is the output and the total fixed cost is 20. Find the total cost function $TC = C(Q)$. 5+5=10

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ECONOMICS

(Major)

Paper : 3.2

(The Monetary System)

Full Marks : 80

Time : 3 hours

The figures in the margin indicate full marks for the questions

1. Answer the following questions : 1×10=10

(a) What is 'standard money'?

(b) Define near money.

(c) Mention one asset of commercial bank.

(d) Give two examples of capital market regulator.

(e) What do you mean by 'moral suasion' as a method of credit control?