TDC (CBCS) Even Semester Exam., 2024

COMMERCE

(4th Semester)

Course No. : COMHCC-402T

(Business Mathematics)

Full Marks : 70
Pass Marks : 28

Time : 3 hours

The figures in the margin indicate full marks for the questions

UNIT—I

1. Answer any *two* of the following questions : 2×2=4

(a) Name different types of matrix.

(b) Evaluate :

$$\begin{vmatrix} 3 & 4 \\ 1 & 2 \end{vmatrix}$$

(c) If

$$\begin{bmatrix} 3 & 5 \\ 1 & 0 \end{bmatrix} = \begin{bmatrix} 2 & -5 \\ -1 & x \end{bmatrix}$$

what is the value of x?

2. Answer any *one* of the following questions : 10

(a) (i) If

$$\begin{bmatrix} 1 & 2 & 5 \\ 1 & -1 & -1 \\ 2 & 3 & -1 \end{bmatrix}$$

find A^{-1}. 5

(ii) Solve by Cramer's rule : 5

$$x+2y+3z=6$$
$$2x+4y+z=7$$
$$3x+2y+9z=14$$

(b) (i) Find adj A, where

$$A=\begin{bmatrix} 1 & 0 & -1 \\ 3 & 4 & 5 \\ 0 & -6 & -7 \end{bmatrix}$$ 5

(ii) If

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

show that $A^2-4A-5I=0$. 5

(Continued)

UNIT—II

3. Answer any *two* of the following questions : 2×2=4

(a) Find the value of

$$\lim_{x\to 2}\frac{x^2+2x-2}{2x+3}$$

(b) State under what conditions $f(x)$ is a continuous function of x at $x=a$.

(c) If $f(x)=2x^2+3x+2$, find $f(0)$.

4. Answer any *one* of the following questions : 10

(a) (i) Evaluate (any *two*) : 2×2=4

(1) $\lim_{x\to 0}\frac{\sqrt{1+x}-\sqrt{1-x}}{x}$

(2) $\lim_{x\to 0}\frac{e^{3x}-1}{x}$

(3) $\lim_{x\to 1}\frac{x^2-3x+2}{x^2-4x+3}$

(ii) (1) A function $f(x)$ is defined as

$$f(x) = 3+2x \quad \text{for} \quad -\frac{3}{2}\le x<0$$
$$= 3-2x \quad \text{for} \quad 0\le x<\frac{3}{2}$$
$$= -3-2x \quad \text{for} \quad x\ge\frac{3}{2}$$

Show that $f(x)$ is continuous at $x=\frac{3}{2}$. 3

(Turn Over)

(2) If

$$f(x)=\frac{cx+d}{dx+c}$$

prove that $f(x)\cdot f\left(\frac{1}{x}\right)=1$. 3

(b) *(i)* Find dy/dx (any *two*) : 3×2=6

(1) $x^3+y^3-3axy=0$

(2) $y=x\log x$

(3) $y=2x^3-3\log x+6e^{2x}$

(ii) Find the maximum and minimum values

$$2x^3-15x^2+36x+10$$ 4

Or

The total cost C of output x is given by $C=300x-10x^2+\frac{1}{3}x^3$. Find the output levels at which the marginal cost and average cost attain their respective minima.

UNIT—III

5. Answer any *two* of the following questions : 2×2=4

(a) What is homogeneous function?

(b) Find the total differential of

$$z=\log(x^2+y)$$

(c) Evaluate :

$$\int x^2\,dx$$

6. Answer any *one* of the following questions : 10

(a) *(i)* Evaluate (any *two*) : 3×2=6

(1) $\int \sqrt{x}(x^2+3x+2)\,dx$

(2) $\frac{e^x-e^{-x}}{e^x+e^{-x}}dx$

(3) $\int xe^x dx$

(ii) Find the area between the line $y=2x$ and x-axis and the ordinate $x=3$. 4

(b) *(i)* Find $\partial u/\partial x$ and $\partial u/\partial y$, if

$$u=\log(x^2+y^2)$$ 4

(ii) (1) Find the total derivatives of u w.r.t. t if $u=x^2+y^2$, $x=t^2$, $y=t^2+1$.

(2) Verify Euler's theorem for the function $x^3+2x^2y+y^3$. 3+3=6

UNIT—IV

7. Answer any *two* of the following questions : 2×2=4

(a) Define annuities. What is called deferred annuity.

(b) Calculate the SI on ₹ 5,000 for 2 years at the rate of 4% p.a.

(c) What is sinking fund?

8. Answer any *one* of the following questions : 10

(a) *(i)* What is the present value of a perpetual annuity of ₹ 500 a year at $2\frac{1}{2}$% p.a.? 5

(ii) Suppose that ₹ 2,450 is deposited at 5·25% compounded continuously. Find the amount after 6·5 years. 5

(b) *(i)* In what time ₹ 825 will amount to ₹ 924 at the rate of 4% SI? 5

(ii) A certain sum compounded annually amounts to ₹ 2,420 in 2 years and ₹ 2,662 in 3 years. Find the principal and rate of interest. 5

UNIT—V

9. Answer any *two* of the following questions : 2×2=4

(a) Define slack and surplus variable.

(b) Write the two assumptions of a linear programming problem.

(c) What is optimal solution?

10. Answer any *one* of the following questions : 10

(a) *(i)* Solve the following LPP using graphical method : 6

Maximize $Z = 6x_1 + 8x_2$

subject to

$$5x_1 + 10x_2 \leq 60$$
$$4x_1 + 4x_2 \leq 40$$
$$x_1, x_2 \geq 0$$

(ii) Explain the following terms : 4

(1) Feasible solution

(2) Unbounded solution

(b) *(i)* Use simplex method to solve the following LPP : 6

Maximize $Z = 5x_1 + 6x_2 + x_3$

subject to

$$9x_1 + 3x_2 - 2x_3 \leq 5$$
$$4x_1 + 2x_2 - x_3 \leq 2$$
$$x_1 - 4x_2 + x_3 \leq 3$$
$$x_1, x_2, x_3 \geq 0$$

(ii) (1) What is Linear Programming Problem?

(2) What are the limitations of Linear Programming Problem? 2+2=4

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