IDP–2/BM (CP)

EASTERN CHRISTIAN COLLEGE ★ LIBRARY
DIMAPUR
Date

2024

(FYUGP)

(2nd Semester)

COMMERCE

(Interdisciplinary Paper)

Paper Code : IDP–2/BM

(Basic Mathematics)

Full Marks : 37½ *Pass Marks* : 40%

Time : 2 hours

(PART : B—DESCRIPTIVE)

(*Marks* : 25)

The figures in the margin indicate full marks for the questions

1. *(a)* What are functions? Write about the different types of functions. Graphically represent any two functions. 1+2+2=5

Or

(b) What are limits? Find the relationship between a and b, so that the function f defined by

$$f(x)=\begin{cases} ax+1, & \text{if } x\le 3 \\ bx+3, & \text{if } x>3 \end{cases}$$

is continuous at $x=3$. 2+3=5

2. (a) Solve the following system of equations, using matrix inversion method : 5

$$3x-2y+3z=8$$
$$2x+y-z=1$$
$$4x-3y+2z=4$$

Or

(b) Solve the following system of equations, using Cramer's rule :

$$x+y-z=6$$
$$3x-2y+z=-5$$
$$x+3y-2z=14$$

3. (a) Find the point of local maxima and local minima for the equation

$$f(x)=x^4-62x^2+120x+9$$ 5

Or

(b) A manufacturer's requirement for a raw material is 2000 units per year. This ordering cost is ₹ 10 per order while carrying cost is 16 paisa per year per unit of average inventory. The purchase price of raw material is ₹ 1 per unit. Find the economic order quantity and the total inventory cost.

4. (a) A company manufactures x units of one item and y units of another. The total cost in dollars, C, of producing these two items is approximated by the function

$$C=5x^2+2xy+3y^2+800$$

(i) If the production quota for the total number of items (both types combined) is 39, find the minimum production cost. 3

(ii) Estimate the additional production cost or savings if the production quota is raised to 40 or lowered to 38. 2

Or

(b) Solve : 2½×2=5

(i) $\int \frac{x}{(x+1)(x+2)}\,dx$

(ii) $\int \frac{2x}{1+x^2}\,dx$

5. (a) To prepare for her future, she deposits \$ 24,000 at the end of each year for 7 years in an account paying 6% compounded annually. How much will she have on deposit after 7 years? 5

Or

(b) Express the interest rate of 6·5% per semiannual period compounded weekly in the following forms : 2+1+1+1=5

(i) Effective rate per week

(ii) Effective yearly rate

(iii) Effective rate per semiannual period

(iv) Effective rate per quarter

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Paper Code : IDP–2/BM

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(PART : A—OBJECTIVE)

(*Marks* : 12½)

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1. Put a Tick (✓) mark against the correct answer in the brackets provided : ½×15=7½

(a) $\lim_{x \to 3} \frac{x-3}{x^2-2x-3}$ is

(i) 0 ( )

(ii) 1 ( )

(iii) $\frac{1}{4}$ ( )

(iv) None of the above ( )

(b) The range of $f(x) = \sqrt{25 - x^2}$ is

(i) (0, 5) ( )

(ii) [0, 5] ( )

(iii) (–5, 5) ( )

(iv) [1, 5] ( )

(c) Let $f : R \to R$ be defined by $f(x) = 2x + \cos x$, then f

(i) has a minimum at $x = \pi$ ( )

(ii) has a maximum at $x = 0$ ( )

(iii) is a decreasing function ( )

(iv) is an increasing function ( )

(d) Let A and B be $n \times n$ matrices such that $BA + B^2 = I - BA^2$, where I is the $n \times n$ identity matrix. Which of the following is always true?

(i) A is nonsingular ( )

(ii) B is nonsingular ( )

(iii) $A + B$ is nonsingular ( )

(iv) AB is nonsingular ( )

(e) $2x - 3y = 0$ and $2x + \alpha y = 0$, for what value of α the system has infinitely many solutions?

(i) $\alpha \neq 3$ ( )

(ii) $\alpha = -3$ ( )

(iii) $\alpha = 2$ ( )

(iv) $\alpha = -2$ ( )

(f) For matrix A, $A^3 = I$, A^{-1} is equal to

(i) A^2 ( )

(ii) A^{-2} ( )

(iii) Cannot say ( )

(iv) None of the above ( )

(g) If x is real, then find the minimum value of $3x^2 - 2x + 8$.

(i) $\frac{23}{2}$ ( )

(ii) $\frac{23}{3}$ ( )

(iii) $\frac{25}{3}$ ( )

(iv) $\frac{29}{2}$ ( )

(h) The income or gain expected from the second-best use of resources lost due to the best use of the scarce resources is known as

(i) marginality principle ( )

(ii) opportunity cost ( )

(iii) incremental principle ( )

(iv) equimarginal principle ( )

(i) Economic order quantity is the quantity at which the cost of carrying is

(i) minimum ( )

(ii) equal to the cost of ordering ( )

(iii) cost of over-stocking ( )

(iv) None of the above ( )

(j) If $V = e^{xyz}$, then $\frac{\partial^3 u}{\partial x\, \partial y\, \partial z}$ at $(1, 1, 1)$ is

(i) $5e$ ( )

(ii) $3e$ ( )

(iii) $2e$ ( )

(iv) $4e$ ( )

(k) Community surplus equals

(i) producer surplus minus consumer surplus ( )

(ii) profits plus utility ( )

(iii) total utility minus plus profit ( )

(iv) consumer surplus plus producer surplus ( )

(l) If $\frac{d}{dx}(f(x))$ is $g(x)$, then the antiderivative of $g(x)$ is

(i) $f(x)$ ( )

(ii) $f'(x)$ ( )

(iii) $g'(x)$ ( )

(iv) $f(x) + g(x)$ ( )

(m) Find the points on the plane $x + y + z = 9$ which are closest to origin.

(i) (3, 3, 3) ( )

(ii) (2, 1, 3) ( )

(iii) (2, 2, 2) ( )

(iv) (3, 4, 1) ( )

(n) A lump-sum consideration against which annuity payments are granted is

(i) annuity value ( )

(ii) present value ( )

(iii) future value ( )

(iv) None of the above ( )

(o) "Depreciation is the gradual and permanent decrease in the value of an asset from any cause." Whose definition is it?

(i) Carter ( )

(ii) Williams ( )

(iii) Spicer ( )

(iv) Coffer ( )

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

(a) (i) Differentiate between even and odd functions.

Or

(ii) What are bounded functions?

(b) (i) Mention about the algebra of matrices.

Or

(ii) What is the condition required for inverse of a matrix to exist?

(c) (i) What do you mean by economic order quantity?

Or

(ii) What is product rule in differentiation?

(d) (i) Differentiate between definite and indefinite integration.

Or

(ii) Differentiate between consumer's and producer's surplus.

(e) (i) What do you mean by deferred annuities?

Or

(ii) Define compounding.