CC-IV Business Mathematics

UG. I. (Sem II)

Time - 3 hrs.
Full marks = 80

Group A

1. Fill in the blanks (1×12)

a) A matrix that appears with one row only is called _____

(b) A matrix that consists of zeros only is called _____

(c) The value of the determinant remains unchanged even if its rows & columns are _____

(d) If any row or column of the determinant consists of zeros only the value of the determinant becomes _____

(e) A function in which each element of the domain corresponds to itself is called an _____ function

(f) An algebric function that can be expressed as a ratio of two polynomials is called a _____

(g) Full form of PERT _____

(h) Full form of CPM _____

(i) The term "annuity" is derived from the latin word '_____'

(j) The person obliged to make such payments is called _____

(k) The person entitled to receive such payments is called _____

(l) The lumpsum consideration against which such payments are granted is called _____

Group B

2. Answer any eight of the following questions (2×8)

a) Find the Simple Interest on Rs 10,000 @ 5% p.a for 7 years?

b) At what rate percent will Rs 4500 become Rs 6120 in 4 years?

c) Differentiate the following function w.r.t. x. e^{2x}.

d) If $A = \begin{bmatrix} 3 & -5 \\ -4 & 2 \end{bmatrix}$. what is A^{-1}.

e) Find the numerical value of the following matrices

$$A = \begin{bmatrix} 2 & 5 \\ 1 & 3 \end{bmatrix} \qquad B = \begin{bmatrix} 1 & -1 \\ -3 & 2 \end{bmatrix}$$

f) Find the product of the following matrices

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

g) Present the following linear equations in the form of matrix.

$$2x + 3y = 13$$
$$5x + 2y = 16$$

h) Find the sum of the following two matrices

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}_{3\times3} \qquad B = \begin{bmatrix} 10 & 11 & 12 \\ 13 & 14 & 15 \\ 16 & 17 & 18 \end{bmatrix}_{3\times3}$$

(i) Find the minors of the following determinants

$$\begin{bmatrix} 8 & 9 \\ -1 & 11 \end{bmatrix}_{2\times 2}$$

(j) Integrate the following function with respect to x

$2x^2 - x$.

Group C

Answer any eight of the following questions (3×8)

a) find the value of the following determinants by co-factor expansion method

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

b) If $A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & -i \\ i & 0 \end{bmatrix}$ where $i^2 = -1$,

verify that $(A+B)^2 = A^2 + B^2$

c) Evaluate the following limits

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

d). $\lim_{x \to 3} \frac{x^2 - 3}{x^2 + 3\sqrt{3}x - 12}$ Evaluate it.

e) The price 'p' per unit at which a company can sell all that it produces is given by the function

$$P(x) = 300 - 4x$$

The cost function is $C(x) = 500 + 28x$, where x is the number of units produced. find 'x' so that the profit is maximum.

f) Calculate the amount and the interest on Rs 10,000 at 5% p.a compounded annually for 3 years.

g) find the effective rate corresponding to 12% pa convertible quarterly.

h) A sum of Rs 1000 is deposited into an account at the end of each year over a period of four years at the rate of 10% compounded annually. calculate the accumulated amount at the end of the period.

i) Differentiate the following with respect to x.

$$(5-2x)^4$$

j) find the differential coefficients of the following functions w.r.t. x.

$$e^x \cdot \log x.$$

Group D

4. using Cramer's Rule find the solution.

$$\begin{aligned} 2x - 3y + 5z &= 11 \\ 3x + 5y - 2z &= 7 \\ x + 2y - 3z &= -9 \end{aligned}$$

(7)

OR

using the property of the determinant, prove that

$$\begin{vmatrix} 1+a & b & c \\ a & 1+b & c \\ a & b & 1+c \end{vmatrix} = (1+a+b+c)$$

5. Differentiate the following function w.r.t x.

$(x^x)^x$ (7)

OR

Evaluate each of the following integrals

$$\int \frac{dx}{\sqrt{x+1} - \sqrt{x}}$$

6. A scooter is purchased on instalment basis such that Rs 6000 is to be paid forthwith and the remainder is 5 yearly instalments of Rs 4000 each. Find the cash price of the scooter reckoning interest at 10% pa compound (7)

OR

A machine the life of which is estimated to be 20 years costs Rs 100,000. Find its scrap value at the end of its life if depreciation is charged at 5% p.a on reducing balance method.

7. A firm proposes to purchase some fans or Sewing machine. It has only Rs 5760 to invest and space at most 20 items. A fan costs Rs 360 and a sewing machine Rs 240. profit expected from fan is Rs 22 and a sewing machine is Rs 18. using the graphic method of solution determine the number of fans and sewing machines he should purchase to maximise his profit. Also ascertain the maximum possible profit he can earn

OR (7)

Solve the LPP by Simplex method

Maximise $Z = 4x_1 + 5x_2$

Subject to

$$2x_1 + 3x_2 \leq 12$$

$$2x_1 + x_2 \leq 8$$

and

$$x_1, x_2 \geq 0$$