

**Vidya Vikas Mandal's**  
**Shree Damodar College of Commerce & Economics, Margao-Goa**  
**FY B.Com, Semester-II, Semester End Examination April 2023**  
**(Truncated syllabus 2021-22)**  
**Commercial Arithmetic –II (CC 8)**

**Duration: 2hrs****Max Marks: 80****Instructions:**

- 1) Start each question on fresh page.
- 2) Figures to the right indicate maximum marks.
- 3) Non programmable calculator is allowed.
- 4) Graph paper can be used wherever applicable

**Q 1) Attempt the following questions.****5X4=20**

- a) Find the distance between the points P (3,-5) and Q (6,-2) ?
- b) Evaluate the following  $\int_0^1 (e^x + 2x + 1) dx$ .
- c) The total cost function is given by  $C = 2x^3 - 15x^2 + 24x + 50$ . Find the value of x for which the total cost is decreasing ?
- d) The demand function for a commodity is given by  $P = 16 - \frac{D^2}{4}$ . Find the total revenue and the marginal revenue when  $D=1$  ?
- e) Integrate the following  $\int e^{3x+2} dx$

**OR****Q I) Attempt the following questions.****5X4=20**

- i) Find the coordinates of the point dividing the segment joining the point (-5, -3) ,(2,-4) externally in the ratio 2:3.
- ii) Differentiate the following w.r.t x  
 $y = x^2 + 2x + 5 \log x - e^x$
- iii) Given  $Z = x^2 + y^2 - 5$ , find  $\frac{\partial z}{\partial x}$  and  $\frac{\partial z}{\partial y}$  at the point (1,3).
- iv) Evaluate  $\lim_{x \rightarrow 2} \frac{x^2 - 4}{(x^2 - x - 2)}$
- v) Solve the following linear programming problem by graphical method  

$$\begin{aligned} \text{Max } Z &= 3x + 5y \\ \text{s.t } x + 2y &\leq 20 \\ x + y &\leq 15 \\ y &\leq 6 \end{aligned} \quad x \geq 0 \text{ and } y \geq 0$$

**Q 2) Attempt the following questions.****5X4=20**

- a) Two vertices of a triangle are  $(-1, 4)$  and  $(5, 2)$ . If the Centroid of a triangle is  $(5, 4)$ . Find the third vertex.
- b) Find the equation of the line having y- intercept 3 and parallel to line  $3x - 2y = -4$ .
- c) Show that the function  $f(x) = 2x^3 - 15x^2 + 36x + 5$  has a maximum when  $x = 2$  and minimum at  $x = 3$ . Find the minimum and maximum value of the function.
- d) Evaluate  $\int (x - 2)(x + 7)dx$
- e) Evaluate the following limit  $\lim_{x \rightarrow 3} \frac{\sqrt{x+6}-3}{x^2-9}$

**OR****Q II) Attempt the following questions.****5X4=20**

- i) The equation of a line is  $3x - 7y + 5 = 0$ . Find  
 a) Slope of a line                      b) the x-intercept                      c) the y -intercept
- ii) If  $A = (2, 2)$ ,  $B = (-2, 4)$  and  $C = (2, 6)$  are the vertices of a triangle ABC. Prove that ABC is an isosceles triangle by using distance formula.
- iii) The supply function for a commodity is  $P = x^2 + 5x + 4$  where  $x$  is the quantity supplied. Find the producers surplus when the price is 10.
- iv) The average cost manufacturing  $x$  items is given by  $AC = 1 + 60x - 9x^2 - 2x^3$ . Find  $x$  for which the average cost is a) increasing    b) decreasing.
- v) If  $(a, 1)$ ,  $(2, -3)$  and  $(1, -5)$  are collinear points. Find the value of  $a$ ?

**Q 3) Attempt the following questions.****5X4=20**

- a) Show that the points  $(0, 0)$ ,  $(5, 5)$  and  $(-5, 5)$  are the vertices of a right angled triangle.
- b) Solve the following linear programming problem by graphical method  

$$\begin{aligned} \text{Max } Z &= x + y \\ \text{s.t. } \quad x + 2y &\leq 8 \\ 3x + 2y &\leq 12 \quad x \geq 0 \text{ and } y \geq 0 \end{aligned}$$

c) A function is defined as

$$\begin{aligned} f(x) &= x^2 - 4 & 0 \leq x \leq 2 \\ &= 3x + 2 & 2 \leq x \leq 4 \\ &= x^2 - 1 & 4 \leq x \leq 6 \end{aligned}$$

Discuss the continuity of  $f(x)$  at  $x = 2$  and  $x = 4$ .

d) If the marginal cost function for a product is  $f(x) = 15x^2 + 6x + 4$  and the fixed cost is Rs 200. Find the total cost and average cost function.?

e) The demand and supply function for a commodity are respectively  $p = 5 - \frac{3}{2}D$  and  $p = 3 + \frac{D^2}{2}$ . Find the consumer surplus at equilibrium point.

**OR**

**Q III) Attempt the following questions.**

**5X4=20**

i) Integrate the following  $\int \frac{x^2 - x - 12}{x - 4} dx$

ii) The midpoint of a line segment joining  $(2a, 4)$  and  $(-2, 2b)$  is  $(1, 2a+1)$ . Find the value of  $a$  and  $b$ .

iii) The supply function of a commodity is  $p = x^2 + 10$ . Find the producers surplus when price per unit of the commodity is Rs 35?

iv) If  $f(x, y) = 2x^3 - 11x^2y + 3y^3$ , Show that  $x \frac{\partial f}{\partial x} + y \frac{\partial f}{\partial y} = 3f(x, y)$

v) Find the derivative of the following  $y = 5x^2 \log x$

**Q 4) Attempt the following questions.**

**5X4=20**

a) If  $y = \log x + 5$ , find  $\frac{dy}{dx}$ ,  $\frac{d^2y}{dx^2}$  and  $\frac{d^3y}{dx^3}$

b) Evaluate  $\int (x^6 - \frac{3}{x^2} + \frac{2}{x} + \frac{1}{\sqrt{x}} + 11) dx$

c) If the marginal demand for a certain commodity is  $MD = 3 - 2p$  with demand  $D = 14$  at  $p = 2$ . Find the demand function at  $p = 1$  and  $p = 3$ ?

d) The line segment joining  $A(2, 3)$  and  $B(6, -5)$  is intersected by y-axis at point K. Find the ratio in which K divides AB. Also write down the ordinate of point K.

- e) Find the domain and range of the function given by  $f(x) = 4x-1$ ,  $1 \leq x \leq 5$ .

**OR**

**Q IV) Attempt the following questions.**

**5X4=20**

- i) Examine the continuity of a function at  $x=3$

$$f(x) = \begin{cases} x^2 + 1 & 0 \leq x < 3 \\ \frac{4}{2x-3} & x=3 \\ 2x-3 & 3 < x \leq 6 \end{cases}$$

- ii) ) If the marginal demand and marginal supply function for a certain commodity is given by  $MD = 3p^2 - 6p$ ,  $MS = 15 - 2p$

Assuming that  $p=0$  when demand and supply are zero. Find Demand and supply at  $p = 4$  and  $p = 5$ .

- iii) Differentiate the following w.r.t  $x$ ,

$$y = 2\sqrt{x} + 4^x - 3x^2 + \log x$$

- iv) Show that the point  $(0,-2)$ ,  $(3,1)$ ,  $(0,4)$  and  $(-3,1)$  are the vertices of a square using distance formula.

- v) If  $Z = f(x,y) = x^3 + 3x^2y + y^2$  then verify that  $\frac{\partial^2 f}{\partial x \partial y} = \frac{\partial^2 f}{\partial y \partial x}$