

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)

Max Marks: 80

Duration: 2hrs

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

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

Q 2) Attempt the following questions.

5X4=20

- Two vertices of a triangle are $(-1, 4)$ and $(5, 2)$. If the Centroid of a triangle is $(5, 4)$. Find the third vertex.
- Find the equation of the line having y- intercept 3 and parallel to line $3x - 2y = -4$.
- 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.
- Evaluate $\int (x - 2)(x + 7)dx$
- 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

- The equation of a line is $3x - 7y + 5 = 0$. Find
 - Slope of a line
 - the x-intercept
 - the y-intercept
- 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.
- 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.
- 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.
- If $(a, 1)$, $(2, -3)$ and $(1, -5)$ are collinear points. Find the value of a?

Q 3) Attempt the following questions.

5X4=20

- Show that the points $(0, 0)$, $(5, 5)$ and $(-5, 5)$ are the vertices of a right angled triangle.
- 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 $x=3$

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

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 $\frac{\partial^2 f}{\partial x \partial y} = \frac{\partial^2 f}{\partial y \partial x}$