

RAN-2403000503043002
B.Sc. (Sem. - III) Examination November - 2025
Multidisciplinary Course (Applications Of Calculus In Commerce And Economics)
[Total Marks: 50
સૂચના : / Instructions

- (1) ઉપરોક્ત દર્શાવેલ વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fill up strictly the above details on your answer book
- (2) All questions are compulsory.
- (3) Follow usual notations.
- (4) Figures to the right indicate total marks of the question.
- (5) Use of Scientific non-programmable calculator is allowed.

Seat No.:

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Student's Signature

Q.1. Answer any TEN as directed.
[10]

- 1) What is a break-even point?
- 2) Define variable cost.
- 3) Find $f(-\frac{1}{2})$, $f(1)$ and $f(2)$, if $f(x) = \begin{cases} \frac{1}{x-1}, & \text{if } x < 1 \\ 3x^2 + 1, & \text{if } x \geq 1 \end{cases}$.
- 4) State the quotient rule for differentiation.
- 5) Calculate the second derivative of $g(x) = 6x^5 - 4x^3 + 2x$.
- 6) Define the marginal cost function.
- 7) When the average cost is minimized?
- 8) Define decreasing functions using the first derivative.
- 9) Define the marginal revenue function.
- 10) Define the total revenue.
- 11) Give an example of fixed cost.
- 12) When the revenue or profit is maximized?

Q.2. Attempt any TWO.
[10]

- (1) A bookstore can obtain an atlas from the publisher at a cost of Rs. 10 per copy and estimates that if it sells the atlas for x dollars per copy, approximately $20(22 - x)$ copies will be sold each month. Express the bookstore's monthly profit from the sale of the atlas as a function of price, graph this function, and use the graph to estimate the optimal selling price.
- (2) Suppose the total cost in dollars of manufacturing q units of a certain commodity is given by the function
 $C(q) = q^3 - 30q^2 + 400q + 500$.
 (a) Compute the cost of manufacturing 20 units of the commodity and
 (b) Compute the cost of manufacturing the 20th unit of the commodity.
- (3) A ball has been dropped from the top of a building. Its height (in feet) after t seconds is given by the function
 $H(t) = -16t^2 + 256$
 (a) What is the height of the ball after 2 seconds?
 (b) How far will the ball travel during the third second?

- (c) How tall is the building?
- (d) When will the ball hit the ground?

Q.3. Attempt any TWO. [10]

- (1) Find the local maxima and minima of $f(x) = 2x^3 + x^2 - 7x + 10$ using the second derivative test.
- (2) Differentiate $g(x) = (x^2 - 1)(x^2 + 6x + 2)$ using the product rule.
- (3) Differentiate $k(x) = \frac{3x^3 + 5x}{x + 1}$ using the quotient rule.

Q.4. Attempt any TWO. [10]

- (1) The demand function for a manufacturer's product is given by $x = 70 - 5p$, where x is the number of units and ' p ' is the price per unit. At what value of x will there be maximum revenue? What is the maximum revenue?
- (2) The cost function of a firm is given by $C = 2x^2 + x - 5$, then find
 - (a) the average cost and
 - (b) the marginal cost, when $x = 4$.
- (3) The manufacturing cost of an item consists of Rs. 6000 as over heads, material cost Rs. 5 per unit and labour cost Rs. $\frac{x^2}{60}$ for x units produced. Find how many units must be produced so that the average cost is minimum.

Q.5. Attempt any TWO. [10]

- (1) The marginal revenue function for a product is given by $MR = \frac{6}{(x - 3)^2} - 4$. Find
 - (a) the demand function and
 - (b) total revenue function.
- (2) The marginal cost (MC) of a product is given to be a constant multiple of number of units x produced. Find the total cost function, if fixed cost is Rs. 5000 and the cost of producing 50 units is Rs. 5625.
- (3) The demand function for a product is given as $p = 30 + 2x - 5x^2$, where x is the number of units demanded and p is the price per unit. Find
 - (a) total revenue
 - (b) Marginal revenue
 - (c) MR when $x = 3$
