RB-3514
First Year B. B. A. (Sem. II) Examination
March / April – 2017
Quantitative Methods - II

Time: Hours [Total Marks: 50]

Instructions:

1. Use of simple calculator is allowed.
2. Indicate your option clearly.
3. Figures to the right indicate full marks.

1. Answer the following Questions:
   i. If \( A = \{a, b, c\} \) then find \( P(A) \).
   ii. If \( f(x) = x^3 - 2x + \frac{1}{x} \) then find \( f(x) + f(-x) \).
   iii. \( \lim_{x \to \frac{1}{2}} \frac{2x^2 - 7x + 6}{5x^2 - 11x + 2} \)
   iv. If \( f(x) = 3x^3 - 4x^2 + 2x + 7 \) and \( f''(x) = -28 \). Then Find \( x \).
   v. Evaluate: \( \int x^\frac{1}{2} dx \)

2. a. The survey of housing society of 250 residents in a city provided the following information:
   i. Every resident can speak Gujarati or Marathi.
   ii. 148 residents speak Gujarati.
   iii. 175 residents speak Marathi.
   Find out how many residents of this society speak both the languages and how many speak only Gujarati?

   b. Given the function \( f(x) = x + 5x^2 \) find \( f(a + b) \).

   i. If \( f(x) = \frac{1}{x+1} \) then find \( f(x) - f(-x) \).

3. The demand function for a commodity is known to be linear. Suppose customers will demand 5 units when the price is ₹12 per unit and 10 units when the price is ₹9 per unit find the demand function.

OR

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2 a If \( A = \{x; x \in N, |x^3 - 3| \leq 25\}, B = \{y; y \in N, 1 < y < 5\}, C = \{z; z \in N, z^4 = 81\} \), then, Verify that \( A \cup (B \cap C) = (A \cup B) \cap (A \cup C) \).

b (i) If \( f(x) = x^2 + 3x + 2 \) find \( f(x + 1) - f(x - 1) \)
(ii) The demand function of a commodity is \( x = \frac{50 - 2p}{3} \), find the revenue function also find revenue when demand is of 10 units.

c A company has fixed costs of Rs.26,000. The cost of producing one item is Rs. 30. If this item sells for Rs. 43, find the break even point.

3 a Evaluate:
(i) \( \lim_{x \to \frac{\sqrt{x^3 + 3 - \sqrt{3}}}{\sqrt{x + 5 - \sqrt{y}}} \)  (ii) \( \lim_{n \to \infty} \frac{1 + 2 + \ldots + n}{2n^2 + 5} \)  (iii) \( \lim_{x \to 0} \frac{a^{5x} + a^{2x} - 2}{x} \)

b If \( x = at^2, y = 2at \) find \( \frac{dy}{dx} \).

c The cost function of manufacturing a certain article is given by \( C(x) = 3x^2 - 6x + 12 \), where \( x \) is the number of articles manufactured. Find \( x \) for minimum cost.

OR

3 a Evaluate:
(i) \( \lim_{x \to a} \frac{x^{16} - a^{16}}{x^8 - a^8} \)  (ii) \( \lim_{n \to \infty} \left( \frac{n + a}{n} \right)^{5n+3} \)  (iii) \( \lim_{x \to 0} \frac{2x^2 - 3x}{4x} \)

b If \( y = (x)^{1-x+x^2} \) find \( \frac{dy}{dx} \).

c The demand function of a monopolist is \( p = 40 - x \) and his cost function is \( C = 10 + 5x + 0.25x^2 \). How many units should he produce in order to get maximum profit?

4 a If \( y = x^2e^{2x} \) find \( \frac{d^2y}{dx^2} \).

b Evaluate:
(i) \( \int (ax^2 + bx)^3(2ax + b)\,dx \)  (ii) \( \int_0^{\frac{10}{x+6}} 6\,dx \)

c The marginal cost function of manufacturing \( x \) shoes is \( 6 + 10x - 6x^2 \). The total cost of producing a pair of shoes is Rs. 12. Find the total and average cost function.

OR

4 a If \( y = x^2 \log x \) find \( \frac{d^2y}{dx^2} \).

b Evaluate:
(i) \( \int \log x\,dx \)  (ii) \( \int_1^2 (3x - 4)(2 - 5x)\,dx \)

c The marginal cost of producing \( x \) units of a commodity is given by \( MC = 2 + 3\sqrt{x} + \frac{5}{\sqrt{x}} \). If fixed cost is Rs.7 find total cost.