MID-WEST UNIVERSITY
SCHOOL OF MANAGEMENT (MUSOM)
(An Autonomous Institution)
MUSOM EXAMINATIONS SECTION
FINAL EXAMINATION-2024 (2080)
BACHELOR OF BUSINESS ADMINISTRATION (BBA)
SEMESTER – II

Subject: Basic Mathematics | Course Code: MGT 423
Full Marks: 100 | Time: 3 Hrs.

Exam Roll No.: ....

Section A: Multiple Choice Questions (1 × 15 = 15 Marks)   Time: 15 Minutes

Tick (✓) the correct answers

1. A whole number is denoted by _____.
   a. R
   b. Q
   c. Z
   d. W

2. A set A = {x: x is odd number, 1 < x <10} is _____.
   a. {2, 3, ...,10}
   b. {3, 5, 7, 9, 11}
   c. {1, 3, 5, 7, 9}
   d. {3, 5, 7, 9}

3. Find the value of $|-14| + |-3| - |-5|$
   a. -22
   b. 12
   c. 22
   d. -12

4. The linear function is represented by _____.
   a. $f(x) = mx + c$
   b. $f(x) = 6$
   c. $f(x) = 3x^2 + 5x - 6$
   d. $f(x) = x^3 + 3x$

5. The condition of loss function is _____.
   a. $R(x) - C(x)$
   b. $\pi(x) = 0$
   c. $C(x) - R(x)$
   d. AC - TC

6. The range of the function $f(x) = x^2$, x ∈ R, is _____.
   a. $[0, \infty)$
   b. $(-\infty, 0)$
   c. $(-\infty, \infty)$
   d. {R}

7. Find the value of $\lim_{x \to 2} \frac{3x^2 - 12}{x - 2}$
   a. 0
   b. 12
   c. ∞
   d. 6

8. The function f (x) is decreasing if _____.
   a. $x < y \Rightarrow f(x) = f(y)$
   b. $x < y \Rightarrow f(x) < f(y)$
   c. $x < y \Rightarrow f(x) \leq f(y)$
   d. $x < y \Rightarrow f(x) \geq f(y)$

9. The derivative of $y = \log x^2$ is _____.
   a. 2x
   b. 2 log x
   c. $\frac{2}{x}$
   d. $\frac{1}{x^2}$

10. The integration of $\int_0^1 e^{2x} dx$ is _____.
   a. $\frac{e^2}{2} - \frac{1}{2}$
   b. $e^2 - 1$
   c. e -1
   d. 1

11. Determine the order of the equation. $\left(\frac{d^2y}{dx^2}\right)^3 + 5\left(\frac{dy}{dx}\right)^4 + 16y = 0$
   a. 4
   b. 3
   c. 2
   d. 1

12. The determinant of $\begin{vmatrix} 2 & -5 \\ 3 & -8 \end{vmatrix}$ is _____.

    a. 31
                                c. 46

    b. -34
                               d. -1

13. If two rows or columns in a determinant are interchanged, the value of the determinant is _____.

    a. Same sign
                    c. Identity

    b. Zero
                    d. Opposite sign

14. If $A = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ then $A^2 + 2A$ are equal to _____.

    a. 4A
                    c. 2A

    b. 3A
                    d. 6A

15. The depreciated amount is:

    a. $P_o - P_T$
             c. $P_o + P_T$

    b. $P_T - P_o$
              d. None of these

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You are required to answer in your own words as far as applicable. The figures in the margin indicate the full marks.

Section – B: Short Answer Questions   (8 × 5 = 40 Marks)

Answer any eight questions:

1. Define the closed and opened intervals.   [2+3]
   If A = [-1, 4) and B = [3, 6].   Find: i) AUB   ii) A-B

2. In a factory, 100 workers operate a flat machine, while 52 operate a dial machine. 17 workers can operate both machines. Find the number of workers who operate neither of the two machines.   [5]

3. Write the following inequality by using the modulus sign   [2.5+2.5]
   a) -5<x<-2
   b) -3<x<8

4. a) If $f(x) = x^3 - \frac{1}{x^3}$, show that $f(x) + f\left(\frac{1}{x}\right) = 0$.   [2.5+2.5]

   b) Define the limit of a function. $\lim_{x \to \infty} \frac{2x^2 + 5x - 1}{3x^2 + 8x + 10}$

5. The fixed cost of a new product is 15000, and the variable cost per unit is 500. If the demand function is 2500-50x, x is the number of units demanded, find the minimum number of items that should be produced to achieve break-even.   [5]

6. Find $\frac{dy}{dx}$, a) $y = 7x^{10} + 5x^3 - 6$ b) $y = (x^2 + 1)(x^8 + 2)$.   [2.5+2.5]

7. Integrate the following with respect to x.   [2.5+2.5]

   a) $\int \frac{x^2}{x+2} dx$ b) $\int \left(x + \frac{1}{x}\right) dx$

8. a) If the demand function is p = 40-3x and total cost function C(x) = 50x +500. Find the marginal revenue function and marginal profit function.   [2]

   b) Ramesh bought an investment bank stock for Rs. 100,000, and after 3 months, the value of the share rose by Rs. 150, and dividends of Rs. 5000 had been paid. Find the rate if he sells the stock after 3 months.   [3]

9. Define determinants. Prove that. $\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ b+c & c+a & a+b \end{vmatrix} = 0$ [5]

10. If $A = \begin{bmatrix} 1 & 2 \\ 3 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} -5 & 2 \\ 3 & 7 \end{bmatrix}$. Verify that AB ≠ BA.   [5]

Section – C: Long Answer Questions   (3× 10 = 30 Marks)

Answer any three questions:

11. In an examination conducted by M.U., 55% failed in English, 35% failed in Account, 30% failed in Economics, 16% failed in English and Economics, 10% failed in Economics and Account, 15% failed in English and Account, and 7% failed in all three subjects, find   [10]
    a) The pass percentage in all subjects
    b) The fail percentage in one subject

c) The fail percentage in exactly two subjects

12. A given product can be manufactured at a total cost of $C(x)$ = Rs. $\left[\frac{x^2}{100} + 100x + 40\right]$, where x is the number produced. The price at which each unit can be sold is given by p = Rs. $\left[200 - \frac{x}{400}\right]$.

    a) Determine the total revenue. [2]
    b) Find the maximum revenue. [2]
    c) Determine the production level x at which the profit is maximum. [2]
    d) What are the price per unit and the total profit at this level of production? [2]
    e) Find the break-even points. [2]

13. Evaluate the following [5+5]

    a) $\lim\limits_{x \to \infty} \frac{\sqrt{(1+2x)} - \sqrt{(1-2x)}}{x}$

    b) $\lim\limits_{x \to \infty} \frac{x^{\frac{5}{2}} - a^{\frac{5}{2}}}{x^{\frac{3}{2}} - a^{\frac{3}{2}}}$ where a > 0

14. Find the points where the function $x^3 - 3x^2 - 9x$ decreases or increases. Also, find the stationery and point of inflection of the function. [5+5]

15. a) There are three commodities, X, Y and Z, which are bought and sold by three dealers A, B and C. Dealer A sells 2 units of X and 5 units of Z and purchases 3 units of Y. Dealer B sells 5 units of X, 2 units of Y and purchases 7 units of Z. Dealer C sells 3 units of Y, 1 unit of Z and purchases 4 units of X. In the process, A earns Rs. 11, C earns Rs. 5, but B loses Rs. 12. Find the prices of each of the commodities X, Y and Z. [5]

    b) The value of a machinery plant increased by 10% in the first year, depreciated by 10% in the second year, and increased by 10% in the third year. If at the end of the third year, the value of the machinery plant was Rs.163,350. Find the original value of the machinery plant. [5]

Section – D: Case Study (15 Marks)

16. The research department of a manufacturing company presents the price demand equation P = 48 – 3x for a certain product, where p is the unit price (in rupees), and x is the quantity demanded in units. The financial department provides the cost function $C(x) = 6x + 120$, where $C(x)$ is the cost in rupees for manufacturing and selling the product x units.

    a) Find the domain and range of the function defined by the price-demand equation. [3]
    b) Find the marginal revenue at x = 7, x = 8, and x = 9 and interpret these results. [3]
    c) Find the break-even points. [3]
    d) Find the best production level of products to produce the maximum profit by using the application of derivatives. [3]
    e) What is the company's maximum profit? What is the price per product that produces the maximum profit? [3]

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