TRIBHUVAN UNIVERSITY
FACULTY OF MANAGEMENT
Office of the Dean
May - June 2023

Full Marks: 100
Pass Marks: 50
Time: 3 Hrs.

BIM / First Semester / MTH 204: Basic Mathematics

Candidates are required to answer the questions in their own words as far as practicable.

Group "A"

1. **Brief Answer Questions:**

   [10 × 2 = 20]

   a. If $A = \{1, 2, 3, 4, 5\}$, $B = \{3, 4, 5, 6, 7\}$ and $C = \{1, 3, 5, 7\}$, find $(A \cap B \cap C)$.

   b. Express the complex number $-1 + i\sqrt{3}$ into polar form.

   c. Rewrite $-4 \leq x \leq -1$ by using the modulus sign.

   d. Evaluate: $\lim\limits_{x \to \infty} \dfrac{5x^3 + 3x + 7}{2x^3 + 7x + 9}$

   e. Find a unit vector perpendicular to each of the vectors $\vec{a} = \vec{i} + 3\vec{j} + 2\vec{k}$ and $\vec{b} = 2\vec{i} - 4\vec{j} + \vec{k}$

   f. Find the derivative of $y = e^{2x}$

   g. If $A = \begin{bmatrix} 2 & -4 \\ 4 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 6 \\ 5 & 2 \end{bmatrix}$, find $5(A + B)$.

   h. Find the area bounded by the line $y = 2x + 3$, the x-axis and the ordinates at $x = 2$ and $x = 4$

   i. Solve the different equation: $\dfrac{dy}{dx} = 3x^2$

   j. Find the value of determinant: $\begin{vmatrix} 1 & 3 & 2 \\ 3 & 4 & 1 \\ 2 & 5 & 1 \end{vmatrix}$

Group "B"

Short Answer Questions:(Attempt any SIX Questions)

[6 × 5 = 30]

2. (a) If $\sqrt{a - ib} = x - iy$, prove that $\sqrt{a + ib} = x + iy$

   (b) Find the square roots of $7 - 24i$

3. A function $f(x)$ is defined as follows:

   $$f(x) = \begin{cases} 2x + 5 & for & x < 3 \\ 3x + 2 & for & x = 3 \\ 2x^2 - 7 & for & x > 3 \end{cases}$$

   Find $\lim\limits_{x \to 3} f(x)$ if it exists. Discuss the continuity of the function $f(x)$ at $x = 3$.

4. Evaluate: $\lim\limits_{x \to 2} \dfrac{x - \sqrt{8 - x^2}}{\sqrt{x^2 + 12} - 4}$

5. Find the derivatives of:

   (a) $y = \dfrac{1}{\sqrt{2x + 3} - \sqrt{2x - 3}}$

   (b) $x^3 + y^3 = 27$

6. Evaluate the integrals:

 (a) $\int x^2 . e^x dx$ (b) $\int x^2 . \log x \, dx$.

7. Prove or disprove that the vectors $\vec{a} - 2\vec{b} + 3\vec{c}$, $-2\vec{a} + 3\vec{b} - 4\vec{c}$ and $\vec{a} - 3\vec{b} + 5\vec{c}$ are coplanar.

8. Solve the differential equation: $(1 + x^2) \frac{dy}{dx} + 2xy = 4x^2$

Group "C"

Long Answer Questions:(Attempt any THREE Questions)   *[3 × 10 = 30]*

9. A survey of 500 students who read various newspapers produced the following information:

 280 read Kathmandu Post, 190 read Rising Nepal, 110 read Himalayan Times, 75 read Kathmandu Post and Rising Nepal, 50 read Rising Nepal and Himalayan Times, 45 read Kathmandu Post and Himalayan Times. If 55 students read none of the newspapers, find how many of them read

 a. All three newspapers
 b. Two newspapers only
 c. One newspaper only

 Represent all the sets in venn diagram.

10. The following table shows annual profits in thousand rupees in an industrial concern.

Year	2014	2015	2016	2017	2018	2019	2020
Profit('000'Rs)	15	17	19	20	24	28	26

 a. Determine the equation of the trend line by least square method.
 b. Estimate the profit in the year 2023 and 2024.

11. Solve the following equations by using determinant or matrix method.
 $2x + 5y + 7z = 12$ $x + 2y - z = 0$ $x + y + z = 9$

12. The demand and supply functions for a good are
 $P_d = 50 - 2Q_d$ and $P_s = 14 + 4Q_s$
 respectively, where P and Q denote price and quantity.

 a. Find the equilibrium price and quantity
 b. Find the consumer's surplus and producer's surplus at equilibrium.
 c. Also, find total surplus.

Group "D"

Comprehensive Answer / Case / Situation Analysis Questions: *[20]*

13. The total cost and demand function for a company are

 $TC = \frac{1}{3}Q^3 - 15Q^2 + 480Q + 750$ and

 $P = 536 - 2Q$ respectively .

 a. Find the revenue function and profit function.
 b. Determine the level of output Q for which profit is maximized.
 c. Find the maximum value of marginal profit.
 d. Find the maximum revenue.   *[2+6+6+6]*

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