

Only for 2021  
AD admitted  
Regular  
Students

TRIBHUVAN UNIVERSITY  
FACULTY OF MANAGEMENT  
Office of the Dean  
August 2022

Full Marks: 100  
Pass Marks: 50  
Time: 3 hrs

**BIM / First Semester / MTH 201: Basic Mathematics**

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

**Group “A”**

1. Give brief answer of the following questions.

[ 10×1=10 ]

- a) Find  $7(A-B)$ , where  $A = \begin{pmatrix} 3 & 2 & 6 \\ 4 & 5 & 7 \end{pmatrix}$  and  $B = \begin{pmatrix} 1 & 3 & 6 \\ -3 & 2 & 5 \end{pmatrix}$ .
- b) Find the value of determinant:  $\begin{vmatrix} 1 & 2 & 2 \\ 2 & 3 & 2 \\ 3 & 4 & 3 \end{vmatrix}$
- c) Evaluate:  $\lim_{x \rightarrow \infty} \frac{7x^2 + 5x - 2}{2x^2 + 9x - 5}$
- d) Find the area of curve bounded by x-axis and ordinates of  $y=3x^2$  from  $x_1=1$  and  $x_2=2$ .
- e) Solve the following differential equation:  $\frac{dy}{dx} = 3x + 1$
- f) If  $A = \{a, b, c, d, e, f, g, h\}$ ,  $B = \{e, f, g, h, i, j, k\}$  then find  $A \cup B$  and  $A \cap B$ .
- g) Express the following complex number into polar form  $Z = 2 + i\sqrt{3}$
- h) Rewrite the following absolute value sign  $-5 \leq x \leq 11$
- i) Show that the following pair of vectors are orthogonal  $-5\vec{i} + 4\vec{j} - \vec{k}$ ,  $5\vec{i} + 7\vec{j} + 3\vec{k}$  where  $\vec{i}$ ,  $\vec{j}$  and  $\vec{k}$  are the vectors.
- j) Find the derivative of  $y = 3x^2 + e^x - \frac{1}{x} + \log x$

**Group “B”**

Short Answer Questions: (Attempt any SIX Questions)

[10×4=40]

2. (a) find the square roots of complex number  $z = 1 + i\sqrt{3}$   
(b) Express the following complex number in the form of  $\alpha + ib$  and find the modulus  $z = \frac{3 - \sqrt{-25}}{2 - \sqrt{-16}}$
3. if  $f(x) = \frac{2ax+b}{x-1}$ ,  $\lim_{x \rightarrow \infty} f(x) = -3$  and  $\lim_{x \rightarrow \infty} f(x) = 4$ , prove that  $f(2) = 11$ .
4. A function  $f(x)$  is defined as:  $f(x) = \begin{cases} x^2 + 2 & \text{for } x < 3 \\ 9 & \text{for } x = 3 \\ 4x - 1 & \text{for } x > 3 \end{cases}$  is the function continuous at  $x=3$ ? If not, how can you make it continuous?
5. Find  $\frac{dy}{dx}$  of the following function: (a)  $y = \frac{1}{\sqrt{2x-3} - \sqrt{2x-5}}$  (b)  $x^3 - y^3 = a^3$
6. Evaluate the following integrals:  
(a)  $\int \frac{e^x}{1+e^x} dx$  (b)  $\int_0^1 \int (5x+3)\sqrt{2x+1} dx$

7. Prove or disprove the vectors  $\vec{a} - 2\vec{b} + 3\vec{c}$ ,  $-2\vec{a} + 3\vec{b} - 4\vec{c}$ ,  $\vec{a} - 3\vec{b} + 5\vec{c}$  are coplanar, where  $\vec{a}$ ,  $\vec{b}$  and  $\vec{c}$  are any vectors.
8. Solve the following linear differential equation:  $x \frac{dy}{dx} + y = x^3$

**Group “C”**

**Long Answer Questions: (Attempt any THREE Questions)**

**[3×10=30]**

9. In a survey of 100 students of a campus, the number of students who read various newspaper were found to be as follows:

Newspaper	Number of student
Kathmandu post	28
Rising Nepal	30
Himalayan Times	32
Kathmandu post and Rising Nepal	8
Rising Nepal and Himalayan Times	5
Kathmandu Post and Himalayan Times	10
All the three news paper	4

Find (i) how many students read none of the three newspapers? (ii) how many students read Himalayan Times only? (iii) how many students read Rising Nepal only? (iv) how many students read Rising Nepal and Himalayan Times only? Represent all the sets in Venn diagram.

10. The following table shows the yearly income of a family:

Year	2016	2017	2018	2019	2020	2021	2022
Income (Rs millions)	5	7	8	10	9	11	12

Obtain the equation of straight line by least square method. Also estimate the income of the family for the years 2023 and 2024.

11. There are three foods X, Y and Z in a restaurant. A packet of food X contains 1 unit of calcium, 2 units of protein and 3 units of carbohydrate. A packet food Y contains 2 units of calcium, 3 units of protein and 1 unit of carbohydrate. A packet food Z contains 3 units of calcium, 1 unit of protein and 2 unit of carbohydrate. If the price of foods X,Y and Z are Rs 27, Rs 16 and Rs 19 respectively. Find the price per unit of calcium, protein and carbohydrate. ( Use Cramer’s rule or Inverse matrix method).
12. The demand and supply function under perfect competition are  $pd = 20 - 5Q$  and  $PS = 4 + 3Q$  respectively, where p and Q denote price and quantity. Find the consumer’s surplus, producer’s surplus and total surplus.

**Group “D”**

**Comprehensive Answer /case/situation Analysis Questions:**

**[20]**

13. A silver company product x quintals of silver per week and it’s total cost (Rs) is expressed as:

$$C(x) = 480x - 15x^2 + \frac{1}{3}x^3$$

- Find the minimum value of the marginal cost.
- Find the minimum value of average cost.
- Find the output at which marginal cost is equal to average cost.
- Show that the marginal cost and average cost are equal at the minimum average cost.

[6+6+6+2]