



I Semester Degree Examination, March/April 2023
(F + R) (NEP) (2021 – 22 and Onwards)
(Open Elective)
MATHEMATICS (Paper – I)
Business Mathematics – I

Time : 2½ Hours

Max. Marks : 60

Instruction : Answer all questions.

PART – A

Answer any 4 questions : (4×2=8)

1. Write $A = \{1, 4, 9, 16, 25, \dots\}$ in set-builder form.
2. Define equivalence relation.
3. How many five digits numbers can be formed with 0, 1, 2, 3, 5 which are divisible by 5 ?
4. If $A = \begin{bmatrix} 0 & -2 \\ -2 & 0 \end{bmatrix}$, then prove that $A^2 - 4I = 0$, where I is the identity matrix.
5. Define skew-symmetric matrix.
6. If $5 : 20 :: 3 : x$, then find x .

PART – B

Answer any 4 : (4×5=20)

1. If $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$, $A = \{1, 3, 5, 7, 9\}$, $B = \{2, 4, 6, 8, 10\}$, $C = \{1, 2, 3, 4\}$, find $A' \cap (B \cup C)'$ and $B' \cap A'$.
2. A survey shows that 75% of the Indians like apples, 68% like oranges. What is the percentage of Indians like both apples and oranges ? Also represent the solution using Venn diagram.



3. Find the adjoint of the matrix $A = \begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix}$.

4. Show that $\begin{vmatrix} b+c & a & a \\ b & c+a & b \\ c & c & a+b \end{vmatrix} = 4abc$.

5. If $x : y = 2 : 3$, find the value of $x^2y + xy^2 : x^3 + y^3$.

6. Two vessels contains mixture of milk and water in the ratio 4 : 5 and 5 : 1 respectively. In what proportion the quantities from the two vessel should be mixed together so that the mixture thus formed may contain milk and water in the ratio 5 : 4 ?

PART - C

Answer any 4 questions :

(4×8=32)

1. a) If $\log x - 2\log\left(\frac{6}{7}\right) = \frac{1}{2}\log\left(\frac{81}{16}\right) - \log\left(\frac{27}{196}\right)$, find x .

b) Show that the function $f : \mathbb{N} \rightarrow \mathbb{N}$ given by $f(x) = 2x$ is one-one but not onto. (4+4)

2. a) Prove that $\left(\frac{x^{b-c}}{x^{a-c}}\right)^{b+a} \times \left(\frac{x^{c-a}}{x^{b-a}}\right)^{c+b} \times \left(\frac{x^{a-b}}{x^{c-b}}\right)^{a+c} = 1$.

b) Simplify $\log_5 \frac{\sqrt[4]{25}}{625}$. (4+4)

3. Solve the following equations using matrix method :

$$x + y + z = 4$$

$$2x - y + 3z = 1$$

$$3x + 2y - z = 1$$

4. a) If $A = \begin{bmatrix} 2 & -1 \\ 3 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$, show that $(AB)' = B'A'$.

b) If $A = \begin{bmatrix} 3 & -1 & 2 \\ 3 & 1 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 4 & 6 \\ 1 & 3 & -1 \end{bmatrix}$, find

i) $2A - 3B$

ii) $5A + 2B$.

(4+4)

5. A precious stone worth Rs. 7,800 is accidentally dropped and broken into 3 pieces the weights of which are in the ratio 5 : 7 : 8. The value of stone proportional to the square of the weight. Calculate the loss thus incurred by the breakage.
6. The increase of A, B and C taken together is Rs. 39,000. A spends 80% of his income, B spends 87½% of his income and C spends 90% of his income. If their savings are in the ratio 16 : 17 : 12, find their annual savings in rupees.
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