

**2311000901040001**  
**F.Y. B.C.A (NEP) (Semester – I)**  
**Examination December-2023**  
**MDC-102-Mathematics**

Seat No:

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[Time: Two hours]

[Max. Marks: 50]

- Instructions:** 1) All questions are compulsory.  
 2) Figures to the right indicate marks of the corresponding question.

Student's Signature

**Q.1** Answer the following (Any ten)**10**

- 1) For any set A,  $A \cap A' =$ -----
- 2) If  $A = \begin{bmatrix} 4 & 7 \\ -12 & -21 \end{bmatrix}$  then  $\det(A) =$ -----
- 3) If  $f(x) = x^3$  then what is value of  $f(-2) - f(-3)$
- 4) If  $f: N \rightarrow Z, f(x) = 4x$  is a function then Co-domain of f is -----
- 5) If truth value of a statement p is F then the truth value of  $(\sim(\sim p))$  is -----
- 6) By De-Morgan's law:  $\sim(p \vee q) =$ -----
- 7) State associative property for '+' in Boolean Algebra.
- 8) For two sets A and B,  $(A \cup B)' =$ -----
- 9) If A is symmetric matrix then  $A^T =$ -----
- 10) If  $U = \{1, 2, 3, \dots, 8\}$  and  $A = \{1, 2, 3, \dots, 7\}$  then  $A' =$ -----
- 11) Define cost function.
- 12) If  $A = \{1, 2, 3, 4, 5\}$  then  $n(A) =$ -----

**Q.2** Answer the following (Any Two)**10**

- 1) In a college there are 500 students and from them 300 have taken Statistics and 150 have taken Mathematics. If all the students have taken at least one of these two subjects, then find the number of students who have taken both the subjects.
- 2) In usual notation prove that  $A \times (B \cup C) = (A \times B) \cup (A \times C)$ .
- 3) If  $A = \{x/x^2 - 17x + 16 = 0\}$ ,  $B = \{y/y^2 - 7y + 12 = 0\}$  and  $C = \{1, 2, 3, 4\}$  then prove the following:
  - i)  $A - (B \cap C) = (A - B) \cup (A - C)$
  - ii)  $(A \cup B) - (A \cap B)$ .

**Q.3** Answer the following (Any Two) **10**

- 1) The fixed cost of a factory producing a particular type of pens is Rs. 7500 and the variable cost per pen is Rs. 150. If the selling price per pen is Rs. 300, find the number of pens to be produced for no profit-no loss.
- 2) If  $f(x) = \frac{x^2+4x}{x+6}$  then find  $\frac{f(0)+f(2)}{f(2)+f(3)}$ .
- 3) If  $f(x) = \frac{1}{x+1}$  then find the value of  $f(-x) - f(x)$ .

**Q.4** Answer the following (Any Two) **10**

- 1) Using truth table prove the Distributive law for conjunction over disjunction.
- 2) Check whether  $D_{10}$  is a Boolean Algebra or not;  $\forall a, b \in D_{10}$   
 $a + b = \text{L.C.M. of } a, b$   
 $a \cdot b = \text{G.C.D. of } a, b \text{ and } a' = \frac{10}{a}$
- 3) Check the validity of the logical arguments  
Hypothesis:  $S_1: p \wedge (\sim q) \Rightarrow r, S_2: p \vee q, S_3: q \Rightarrow p$   
Conclusion:  $S: r$

**Q.5** Answer the following. (Any Two) **10**

- 1) If  $\begin{bmatrix} 4 & 10 \\ 3 & 9 \end{bmatrix} X = \begin{bmatrix} 2 & -3 \\ 1 & 2 \end{bmatrix}$  then find X.
- 2) Solve the following equations using Cramer's rule:  $\frac{1}{x} - \frac{2}{y} = 6; \frac{3}{x} + \frac{5}{y} = 7$ .
- 3) If  $A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & -2 & 1 \\ 2 & 3 & 2 \end{bmatrix}$  and  $B = \begin{bmatrix} 2 & -1 & 4 \\ 1 & -3 & 2 \\ -1 & 3 & 2 \end{bmatrix}$  then show that  $(AB)^T = B^T A^T$ .