RAN-1811000101020001

RAN-1811000101020001

F. Y. B.C.A (Semester - I) Examination

February - 2021

Mathematics I: -102

Time: 3 Hours] **[Total Marks: 70**

સૂચના : / Instructions

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી. **Fill up strictly the details of ☛ signs on your answer book** Name of the Examination: ☛ **F. Y. B.C.A (Semester - I)** Name of the Subject : ☛ **Mathematics I: -102** Subject Code No.: **1811000101020001**	Seat No.: Student's Signature

(2) All questions are compulsory.

(3) Figures to the right indicate marks of corresponding question.

(4) Follow usual notations.

(5) Use of non-programmable scientific calculator is allowed.

Q-l] Answer the following: **[10]**

1] If A = {2, 3} then find A^2

2] Define one one and many one function.

3] Evaluate: $\begin{vmatrix} a+b & a-b \\ a-b & a+b \end{vmatrix}$

4] Define Conjunction and Disjunction.

5] If A = $\begin{bmatrix} 2 & 3 \\ 1 & 4 \end{bmatrix}$ and B = $\begin{bmatrix} 5 & 1 \\ 0 & 3 \end{bmatrix}$ then find AB.

Q-2](a) In usual notations prove that $n(A \cup B) = n(A) + n(B) - n(A \cap B)$ **[05]**

OR

(a) In usual notations prove that $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$ **[05]**

(b) Attempt any two: **[10]**

1] If $A = \{x : x \leq 3; x \in N\}$, $B = \{x : 1 < x \leq 5; x \in N\}$ & $C = \{x : x$ is an even positive integer less than $10\}$ then prove that $A \cap (B - C) = (A \cap B) - (A \cap C)$

2] If $U = \{x : x \in N; x \leq 10\}$, $A = \{x : x \in N ; x^2 < 10\}$ and $B = \{x : x \in N; 2 \leq x \leq 5\}$ then prove that $(A \cup B)' = A' \cap B'$

3] If $A = \{2, 4\}$, $B = \{2, 4, 6\}$ find $A \times B$, $A \times A$, $B \times B$ and $B \times A$. Check whether $A \times B = B \times A$.

4] There are 30 students in a class. Among them, 8 students are learning both English and French. A total of 18 students are learning English. If every student is learning at least one language, how many students are learning French in total?

Q-3](a) If the cost function of a commodity is $C = 1200 - 45x + 2x^2$ then find the total cost for producing 25 units. **[05]**

OR

(a) It is observed that a quadratic function $ax^2 + bx + c$ fits the data points (1, 9), (2, 14) and (3, 23). Find the constants a, b and c and find y when x = 4. **[05]**

(b) Attempt any two: **[10]**

1] If $f : N \to N$ and $f(x) = 2x - 3$. If the range of function is $\{-3, 1, 0\}$ find the domain of f.

2] If $y = f(x) = \dfrac{ax+b}{cx-a}$ then prove that $x = f(y)$.

3] If $f(x) = \dfrac{1}{x}$, $x \in Z - \{-1, 0, 1\}$ then prove that $f(x - 1) - f(x + 1) = \dfrac{2}{x^2-1}$

4] If $f(x) = x^2$ and $g(x) = 5x - 6$ where $x \in \{2, 3\}$. Prove that $f = g$.

Q-4](a) Prove that $\begin{vmatrix} b+c & c+a & a+b \\ a+b & b+c & c+a \\ c+a & a+b & b+c \end{vmatrix} = 2 \begin{vmatrix} a & b & c \\ c & a & b \\ b & c & a \end{vmatrix}$ **[05]**

OR

(a) A factory produces two types of items A and B. For the production of these two items two machines are used. For producing one unit of item A first machine is used for 2 hours and second machine is used for 5 hours, and producing one unit of item B first machine is used for 3 hours and second machine is used for 1 hour. If the total time available on these two machines is respectively 85 hours and 115 hours, find the number of units A and B that should be produced. **[05]**

(b) Attempt any two: **[10]**

1] If $A = \begin{bmatrix} 6 & 3 \\ -3 & 9 \\ 12 & -6 \end{bmatrix}$ find matrix B such that $2A^T + 3B = 0$

2] Find AB and BA if $A = \begin{bmatrix} 1 & -1 & 1 \\ -3 & 2 & -1 \\ -2 & 1 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 6 \\ 1 & 2 & 3 \end{bmatrix}$

3] If $\begin{bmatrix} 4 & 10 \\ 3 & 9 \end{bmatrix} X = \begin{bmatrix} 2 & -3 \\ 1 & 2 \end{bmatrix}$ then find X

4] Solve the following equations by Cramer's Rule:

$$\frac{x}{3} + \frac{y}{4} = 1$$
$$\frac{2x}{9} - \frac{y}{2} = 6$$

Q-5](a) Using truth table prove that $(p \Rightarrow q) \wedge (q \Rightarrow r) = p \Rightarrow r$ **[05]**

OR

(a) Check the validity of the following argument: **[05]**

Hypothesis $S_1 : p \Rightarrow q$, $S_2 : \sim p$

Conclusion: $S : q$

(b) Attempt any two: **[10]**

1] Construct the input/output table for

$f : B^3 \rightarrow B$, $f(x_1, x_2, x_3) = (x_1 \cdot x_2') + x_3$

2] Using truth tables prove that $p \wedge (q \vee r) = (p \wedge q) \vee (p \wedge r)$.

3] Show that $[(\sim q) \Rightarrow (\sim p)] \Rightarrow (p \Rightarrow q)$ is a tautology.

4] Show that $(D_6, +, \cdot, ', 1, 6)$ is a Boolean Algebra $\forall x, y \in D_6$

$x + y$ = LCM of x, y and $x \cdot y$ = GCD of x, y

$x' = 6/x$
