

RAN-1811000101020001

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

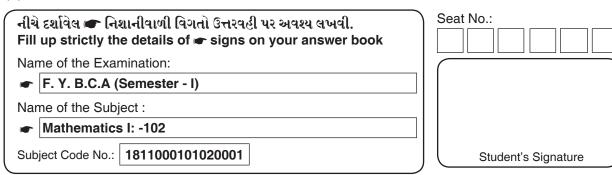
February - 2021

Mathematics I: -102

Time: 3 Hours] [Total Marks: 70

સૂચના : / Instructions

(1)



- (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]

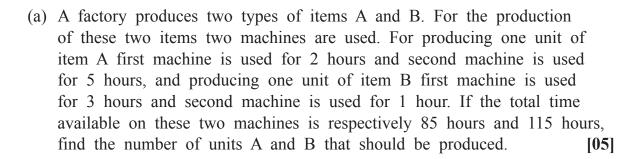
OR

- (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 $A = \{x : x \le 3; x \in N\}$, $B = \{x : 1 < x \le 5; x \in N\}$ & $C = \{x : x \text{ is an even positive integer less than 10}\}$ then prove that $A \cap (B C) = (A \cap B) (A \cap C)$
- 2] If $U = \{x : x \in N; x \le 10\}, A = \{x : x \in N ; x^2 < 10\}$ and $B = \{x : x \in N; 2 \le x \le 5\}$ 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 $y = f(x) = \frac{ax + b}{cx a}$ then prove that x = f(y).
- 3] If $f(x) = \frac{1}{x}$, $x \in Z \{-1, 0, 1\}$ then prove that $f(x 1) f(x + 1) = \frac{2}{x^2 1}$
- 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



(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
$$(p \Rightarrow q) \land (q \Rightarrow r) = p \Rightarrow r$$

[05]

OR

[05]

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

Conclusion: S: q

(b) Attempt any two:

[10]

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

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

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
 $x' = 6/x$