RAN-1811000101020001

RAN-1811000101020001

B.C.A. Sem-I Examination

March / April - 2019

Mathematics I: -102

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

સૂચના : / Instructions

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fill up strictly the details of ☛ signs on your answer book

Name of the Examination:

☛ **B.C.A. Sem-I**

Name of the Subject :

☛ **Mathematics I: -102**

Subject Code No.: **1811000101020001**

Seat No.:

Student's Signature

Instructions:

(1) All questions are compulsory.
(2) Figures to the right indicate marks of corresponding question.
(3) Follow usual notations.
(4) Use of non-programmable scientific calculator is allowed.

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

1] Define: Proper set.

2] If A = {2, 4, 6, 8}, B = {1, 3, 4, 5, 6} then find B - A

3] If $f(x) = x^2 - x + 1$ then find $f(0) + f(-l)$

4] Define: Constant function.

5] Evaluate: $\begin{vmatrix} x+y & x \\ x & x-y \end{vmatrix}$

6] If $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ then find adj. A.

7] Define: Disjunction.

8] Define: Implication.

9] In a Boolean Algebra prove that $x + x = x$.

10] Using De' Morgan's laws write the negation of 4 + 2 = 6 and 4.2 = 8

P0186

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

OR

(a) In usual notations prove that $A - (B \cap C) = (A - B) \cup (A - C)$

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

1] In a class of 42 students, each play atleast one of the three games Cricket, Hockey and Football. It is found that 14 play Cricket, 20 play Hockey and 24 play Football, 3 play both Cricket and Football, 2 play both Hockey and Football. None play all the three games. Find the number of students who play Cricket but not Hockey.

2] If $A = \{x; x^2 - 17x + 60 = 0\}$, $B = \{x; x^2 - 7x + 12 = 0\}$ then find $(A \cup B)-(A \cap B)$

3] If $U = \{x/x \in N; x \leq 10\}$, $A = \{x/x \in N; 2 < x < 6\}$ and $B = \{x/x \in N; x^2 < 5x\}$ then verify that $(A \cup B)' = A' \cap B'$

4] If $A = \{1, 2, 3\}$, $B = \{2,3,4\}$, $C = \{1, 3,4\}$ and $D = \{2,4,5\}$ then prove that $(A \times B) \cap (C \times D) = (A \cap C) \times (B \cap D)$

Q - 3] (a) If $f(x) = \dfrac{x(x-2)}{x-1}$ then find $f(0) + f(-1) + f(3) + f(2)$ **[05]**

OR

(a) The fixed cost of a factory producing particular types of bag is Rs. 9000 and the variable cost per bag is Rs. 110. If the selling price per bag is Rs. 240 then find the profit function.

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

1] If $f: N \rightarrow N$, $f(x) = \dfrac{x^2 (x+1)^2}{4}$ find $f(x) - f(x - 1)$

2] If $f: Z - \{-1\} \rightarrow Z$ where $f(x) = \dfrac{x^3 + 1}{x + 1}$ and $g: Z \rightarrow Z$ where $g(x) = x^2 - x + 1$ then examine whether the functions are equal.

3] If $f(x) = \dfrac{x^2 - x}{x + 3}$ then find $\dfrac{f(1) + f(2)}{f(-2) + f(0)}$

4] If the demand function is $d = f(p) = 2000-3p^2$ then find the demand when p=25 and find p when demand is 4.

Q - 4] (a) $A=\begin{bmatrix} 0 & 4 & 3 \\ 1 & -3 & -3 \\ -1 & 4 & 4 \end{bmatrix}$ then prove that $A^2 = I$. **[05]**

OR

(a) If $A = \begin{bmatrix} 1 & 2 & -2 \\ 1 & -1 & 3 \\ -1 & -1 & 2 \end{bmatrix}$ then find $A^2 + 2A - I$

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

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

$x + 2y + 3z - 14 = 0$

$2x + y + z - 7 = 0$

$5x + 2y + z - 12 = 0$

2] 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

$(AB)^T = B^T A^T$.

3] Find inverse of the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & -8 \\ 6 & -3 & 0 \end{bmatrix}$

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

$2x + 8y = 3xy$

$4x + 12y = 5xy$

Q - 5] (a) Simplify the Boolean expression: $x + x' \cdot (x + y) + y \cdot z$ **[05]**

OR

(a) Check the validity of the following argument:

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

Conclusion: S: $p \Rightarrow (q \wedge r)$

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

1] Show that S and T are equivalent where S: $\sim [p \vee \{(\sim p) \wedge (\sim q)\}]$ and T: $\sim p \wedge q$

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

3] Express $f(a, b) = (a . b) + (a' . b) + (a . b')$ as a product of sum cannonical form.

4] Show that $(D_8, +, ., ', 1, 8)$ is a Boolean Algebra $\forall x,y \in D_8$
$x + y =$ LCM of x,y
$x \cdot y =$ GCD of x,y
$x' = 8/x$
