RAN-1811000101020001

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F.Y.B.C.A. (Sem.I) Examination

October / November - 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:

☛ **F.Y.B.C.A. (Sem.I)**

Name of the Subject :

☛ **Mathematics I : - 102**

Subject Code No.: **1811000101020001**

Seat No.:

Student's Signature

(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-1] **Answer the following:** **[10]**

1] Define union of two sets with illustration.

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

3] Evaluate: $\begin{vmatrix} -6 & 2 \\ -3 & -4 \end{vmatrix}$

4] Define Implication and Double Implication.

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

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

OR

(a) Prove that

$$n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(B \cup C) - n(A \cap C) + n(A \cap B \cap C)$$

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

1] If A = {1,3}, B = {3,5} and C = {3,5,6} then verify

$A \times (B \cup C) = (A \times B) \cup (A \times C)$

2] If A = {1,3,4,6], B = {2,4,5} and C = {3,4,5} then verify that

$A \cap (B - C) = (A \cap B) - (A \cap C)$

3] If A = {1,2,3}, B = {2,3,5,4} and C = {2,4,6,8} then show that

(i) $A \cup B = (A - B) \cup B$ and

(ii) $A \cap (B - C) = (A \cap B) - (A \cap C)$

4] In a class of 100 students, 35 like Science and 45 like Math. 10 students like both the subjects. How many like either of them and how many like neither?

Q-3] (a) The total cost and total revenue functions are given as $C(x) = 5x + 350$ and $R(x) = 50x - x^2$ then find the profit for $x = 10$. **[05]**

OR

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

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

1] The demand function of bicycle is $d = f(p) = V(5600 - 4p)$. Find demand for price Rs. 1000. At what price of bicycle the demand will be Rs. 20?

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

3] If $f(x) = \dfrac{x^2 - 9x + 14}{x - 2}$, $x \in Z - \{2\}$ and $g(x) = x - 7$, $x \in Z$.
State whether $f(x)$ and $g(x)$ are equal or not?

4] If $f(x) = 2x^2 - 1$ and $g(x) = 2x - 1$; $D_f = D_g = \{0,1,2\}$. Is $f = g$? Justify.

Q-4] (a) Find the inverse of the matrix $A = \begin{bmatrix} 2 & 3 & 1 \\ 0 & 5 & 6 \\ 1 & 1 & 2 \end{bmatrix}$ **[05]**

OR

(a) Solve the following equations by Cramer's Rule:

$3x + 5y + 6z = 4$

$x + 2y + 3z = 2$

$2x + 4y + 5z = 3$

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

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

2] Prove that $\begin{vmatrix} (a-1)^2 & (b-1)^2 & (c-1)^2 \\ 1 & 1 & 1 \\ a+1 & b+1 & c+1 \end{vmatrix} = (a-b)(b-c)(c-a)$

3] If $A = \begin{bmatrix} 4 & 5 \\ 6 & -2 \\ 3 & 7 \end{bmatrix}$ $B\begin{bmatrix} 2 & 5 & 7 \\ 8 & 4 & -3 \end{bmatrix}$ find AB and BA

4] If $A = \begin{bmatrix} 4 & 5 \\ -1 & 8 \end{bmatrix}$ then find $A + A^T + A^{-1} + I$

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

OR

(a) Find the product of sum canonical form of a • b + a' • b + a • b'

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

1] Check the validity of the following argument:

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

Conclusion: S: q

2] Using truth table prove that $(p \Rightarrow q) \wedge (q \Rightarrow r) = p \Rightarrow r$

3] Show that D_9 is not a Boolean Algebra $\forall x, y \in D_9$

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

$x' = 9/x$

4] Construct the input/output table for

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