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BA-3503

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

November/December - 2017

102 : Mathematics - I

Time : 3 Hours] [Total Marks : 70

Instructions :

(1)

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

Name of the Examination :
☛ B. C. A. (Sem. I)

Name of the Subject :
☛ 102 : Mathematics - I

☛ Subject Code No. : 3 5 0 3 ☛ Section No. (1, 2,.....) : Nil

Seat No. :

Student's Signature

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

1 Answer the following: [10]

1] Define complement of a set with illustration.

2] If A= {1, 2, 3} then write the improper subsets of A

3] Define: One One function with illustration.

4] If $f(x) = x^2 - 2x + 3$ and $D_f = \{-2, -1, 1, 2\}$ then find R_f.

5] If A= {1,2,3} then write the power set of A

6] Prove that $p \vee t = t$ where p is the statement and t means tautology.

7] Write the dual statement of $x \cdot (y + z) = (x \cdot y) + (x \cdot z)$

8]In a Boolean Algebra prove that $0' = 1$ and $1' = 0$.

9] Evaluate: $\begin{vmatrix} 3 & 12 \\ 7 & 28 \end{vmatrix}$

10] Define Skew symmetric matrix.

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

OR

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

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

1]In a college there are 500 students out of which 300 have taken Mathematics and 250 have taken Statistics. How many of them have taken both the subjects?

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

3] If $A = \{x: x \in N, 1 \leq x \leq 3\}, B = \{x: x \in N, x^2 - 3x + 2\}$ and $C = \{x: x \in Z, 1 \leq x \leq 3\}$ then verify $A \cup (B \times C) = (A \cup B) \times (A \cup C)$

4]If A= {1,3}, B= {3,5} and C= {3,5,6} the verify A×(BUC) = (A×B)U(A×C).

3 (a) If $f(x) = x(x+1)(2x+1)$ then prove that $f(x) - f(x+1) = 6x^2$. **[05]**

OR

(a)If $f(x) = x^2 + x - 1$ then find the value of $f(x+1) - 3f(x-1) + 2f(x)$

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

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

2] The cost function of an item is C (x) = 4x + 770 and the selling price per unit is Rs. 15. Then find the Break Even point. If the profit is Rs. 1100 then find the number of units to be produced.

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

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

4 (a)If $A = \begin{bmatrix} 1 & 2 & -2 \\ 1 & -1 & 3 \\ -1 & -1 & 2 \end{bmatrix}$ then find $A^2 + 2A - I$ **[05]**

OR

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

$x + 6y = 2xy$

$3x + 2y = 2xy$

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

1] If $A = \begin{bmatrix} 0 & 4 & 3 \\ 1 & -3 & -3 \\ -1 & 4 & 4 \end{bmatrix}$ then prove that $A^2 = I$.

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

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

$x + y - 2z + 1 = 0$

$3x - 2y + 2z - 8 = 0$

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

4] Evaluate: $\begin{vmatrix} x+1 & 2 & 3 \\ 1 & x+2 & 3 \\ 1 & 2 & x+3 \end{vmatrix}$

5 (a) Using truth tables prove that $p \vee (q \wedge r) = (p \vee q) \wedge (p \vee r)$. [05]

OR

(a) Show that $\sim (p \wedge q) \vee (\sim p \wedge q) \vee p$ is a tautology.

(b)Attempt any two: [10]

1] Check the validity of the following argument:

Hypothesis $S_1: p \wedge (\sim q) \Rightarrow r, S_2: p \vee q, S_3: q \Rightarrow p$

Conclusion: S: r

2] Express boolean function $f(a, b, c) = (a \cdot b) + (a \cdot c) + (b \cdot c)$ as a product of sums in three variables.

3] Show that $(D_{10}, +, \cdot, ', 1, 10)$ is a Boolean Algebra $\forall x, y \in D_{10}$

$x + y =$ LCM of x, y

$x \cdot y =$ GCD of x, y

$x' = 21/x$

4] Let $B = \{0, 1\}$. Prepare an input/output table for the boolean function

$f : B^2 \to B, f(x_1, x_2) = x_1 \cdot x_2'$