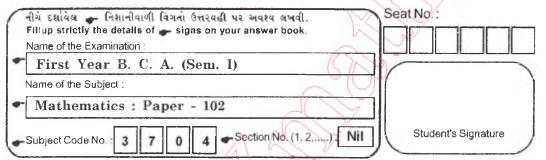**G-3704**

First Year B. C. A. (Sem. I) Examination
November / December – 2014
Mathematics : Paper - 102

Time : 3 Hours] [Total Marks : 70

Instructions :

(1)

(2) All questions are compulsory.

(3) Figure to the right indicate full marks.

Q:1 Answer the following Questions: [10]

1. Explain proper sub set of a non-empty set with illustration.
2. Define equivalent set with illustration.
3. Define symmetric difference of two non-empty sets with illustration.
4. Define Range of the function and find R_f for $f(x) = x^3 - x + 2$, $D_f = \{-1, 0, 1\}$.
5. If $f(x) = x^2 - x + 1$ then find $f(0) + f(1)$
6. Define Break-even point.
7. Define Duality in Boolean algebra.
8. Define Boolean Algebra.
9. Define symmetric matrix with illustration.
10. Define Inverse of a matrix.

Q: 2 (A) State & prove Distributive law of intersection over union. [05]

OR

Q: 2 (A) in usual notations prove that $A \times (B \cup C) = (A \times B) \cup (A \times C)$. [05]

Q: 2 (B) Attempt any two: [10]

(1) If $A = \{x \leq 4; x \in N\}$, $B = \{x : x^2 \leq 4; x \in Z\}$ and $C = \{x : -2 \leq x \leq 3; x \in N\}$ then verify that $A - (B \cap C) = (A - B) \cup (A - C)$.

(2) If $A = \{2, 3, 4, 5\}$, $B = \{3, 4, 5, 6, 7\}$, $\& C = \{2, 4, 6, 8\}$ Then verify $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$.

(3) If $A = \{0, 1\}$, $B = \{-1, 0, 1\}$ and $C = \{-1, 0, 1, 2\}$ then verify that $(A \cup B)' = A' \cap B'$

(4) In a college there are 500 girls and of them 300 have taken Economics and 250 have taken Mathematics. How many of them have taken both the subjects? All girls have taken at least one of these two subjects.

G-3704] 1 [Contd...

Q: 3 (A) . Examine whether the following functions are equal or not

$$f(x) = \frac{x^2 - 9x + 14}{x - 2}, x \in Z - \{2\} \text{ and } g(x) = x - 7, x \in Z - \{2\}$$ [05]

OR

Q: 3 (A) If $f(x) = \frac{x(x-2)}{x-1}$ then find $f(0) + f(-1) + f(3) + f(2)$ [05]

Q: 3 (B) Attempt any two: [10]

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

2. If $f(x) = 2x^2 - 1$ and $g(x) = 2x - 1, x \in \{0,1,2\}$, are the functions equal?

3. The total cost and total Revenue function are given as $C(x) = 5x + 350$ and

   $R(x) = 50x - x^2$ then find profit for $x = 10$.

4. It is observed that a quadratic function fits the data points $(1,9),(2,14),(3,23)$.

   Find the function and estimate y when $x = 4$.

Q:4 (A) Show that D_9 is a Boolean Algebra where $\forall a, b \in D_9$ [05]

   $a + b = $ L.C.M. of a,b

   $a \bullet b = $ G.C.D. of a,b

   $a' = 9 / a$

OR

Q: 4 (A) Check the validity of the following argument [05]

$$S_1 : p \Rightarrow (\sim q)$$
Hypothesis: $S_2 : r \Rightarrow q$ Conclusion: $S : (\sim p)$
$$S_3 : r$$

Q: 4(B) Attempt Any two [10]

1. Using Truth table that $(p \Rightarrow q) \wedge (p \Rightarrow r) = p \Rightarrow (q \wedge r)$.

2. Prove the validity of the following argument

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

   Conclusion: $S : p \Rightarrow q$ $S : p \Rightarrow q$

3. Construct the input /output table for

   (i) $f(x) = (x_1, x_2, x_3) = (x_1 \bullet x_2)' + x_3$ (ii) $f(x) = (x_1, x_2) = x_1' \bullet x_2$

4. . Using Truth table that $p \wedge (q \vee r) = (p \wedge q) \vee (p \wedge r)$.

G-3704]   2   [Contd...

Q:5(A) . then find $A = \begin{bmatrix} 1 & 2 & 1 \\ 2 & 1 & 3 \\ 2 & 1 & 4 \end{bmatrix}$ $A^2 - 2A + I$ [05]

OR

Q: 5(A) If $A = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 1 & 2 \\ 0 & 3 & 6 \end{bmatrix}$ then obtain adj.A and A×(adj.A) [05]

Q: 5(B) Attempt Any TWO [10]

1. If $A = \begin{bmatrix} 7 & 3 & 5 \\ 0 & 3 & 2 \\ 1 & 5 & 4 \end{bmatrix}$, $B = -A$ and $C = -2B$ then find $2A + B + C$

2. Solve the following system of equations using crammer's rule

$$\frac{x}{3} + \frac{y}{4} = 1$$

$$\frac{2x}{9} - \frac{y}{2} = 6$$

3. Show that D_8 is a Boolean Algebra where $\forall a, b \in D_8$

$a + b = $ L.C.M. of a,b

$a \bullet b = $ G.C.D. of a,b

$a' = 8 / a$

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

_____