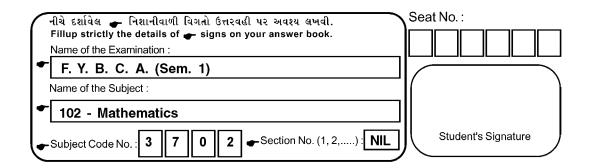


## **UA-3702**

## First Year B. C. A. (Sem. I) Examination March/April - 2012 102 - Mathematics

Time: Hours] [Total Marks: 70

## **Instruction:**



1 Answer the following questions:

- 10
- (1) If  $A = \{a, b, c, d, e\}$  then write no. of subsets in powerset of A.
- (2) If  $A = \{4, 5, 6\}, B = \{1, 2, 3\}$  then find  $(A B) \cap (B A)$ .
- (3) Define one-one function.
- (4) If  $f(x) = x^2 1$  then find f(x+1).
- (5) Define Boolean Algebra.
- (6) Define contradiction.
- (7) Find the equation of a line passing through orign and having slope 1/5.
- (8) Find the value of k such that 3kx + 5y + k = 0 passes through the point (-1, 4).
- (9) If  $A = \begin{bmatrix} -3 & 1 \\ 2 & 4 \end{bmatrix}$  then find adj.A.
- (10) Define transpose of a matrix with illustration.
- 2 (a) State and prove De Morgan's law for Intersection. 4

(b) Let 
$$U = \{x \mid 3 \le x \le 13, x \in N\}$$
 4
$$A = \{y \mid 1 < y < 8\}$$

$$Z = \{z \in N \mid z^2 = 25\} \text{ then (1) find } A' \text{ and } B'$$
(2) Verify that,  $A - (B \cup C) = (A - B) \cap (A - C)$ 

(c) If 
$$A = \{x \mid x^2 - x - 2 = 0\}$$
 and  $B = \{x \mid x^2 - 5x + 6 = 0\}$  then find  $A \cup B$  and  $A \cap B$ .

OR

2 (a) In usual notation prove that  $A \times (B \cap C) = (A \times B) \cap (A \times C)$ 

(b) If 
$$A = \{x \mid 1 < x < 10, x \text{ is an even number}\}$$

$$B = \{x \mid 2 \le x < 9, x \text{ is an odd number}\}$$

$$C = \{x \in N \mid x^2 = 9\} \text{ then verify that,}$$

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

(c) If 
$$U = \{x \mid x \in N, | < x < 10\}$$

$$A = \{x \mid 2 \le x \le 9\}$$

$$B = \{3, 5, 6\} \text{ then prove that}$$

(1)  $(A \cup B)' = A' \cap B'$  (2)  $(A \cap B)' = A' \cup B'$ 

3 (a) The cost of manufacturing 50 pens is Rs. 15,000 and that of manufacturing 300 pens is Rs. 40,000. If the relationship between the number of units produced and its cost is linear, then find the relation. Also find the cost of manufacturing 400 pens.

(b) If 
$$f(x) = \frac{x^2 - 25}{x - 5}$$
;  $x \in \mathbb{Z} - \{5\}$  and 
$$g(x) = x + 5$$
;  $x \in \mathbb{Z}$ . Is  $f(x) = g(x)$ ?

(c) If  $f(x) = \frac{1}{x}$ ;  $x \in \mathbb{Z} - \{-1, 0, 1\}$  then P.T.,  $f(x+1) - f(x-1) = 2/1 - x^2.$ OR

3 (a) Define domain and range of a function. If domain 4 of  $f(x) = \sqrt{x^2 + 3}$  is  $\{1, 2, 3, 4\}$  then find range of f.

(b) If 
$$f(x) = \frac{x^2 - 5x + 7}{x^2 + 2}$$
;  $x \in Z$  then find  $\frac{f(1) + f(-2)}{f(-1) + f(0)}$ .

(c) If 
$$y = f(x) = \frac{ax + b}{cx - a}$$
 then prove that  $x = f(y)$ .

4 (a) Let  $D_9$  be the set of positive divisors of 9. 4 Define +,  $\cdot$  &' on  $D_9$  as follow: a+b=lcm of a & b  $a\cdot b=\gcd \text{ of } a \& b$   $a'=\frac{9}{a} \text{ then verify that } (D_9,+,\cdot,',1,9) \text{ is a Boolean algebra.}$ 

(b) Find the value of 
$$((x_1 \cdot x_2) + x_3) \cdot x_2$$
 if:

(1) 
$$x_1 = 0$$
,  $x_2 = 1$ ,  $x_3 = 1$ 

(2) 
$$x_1 = 0, x_2 = 0, x_3 = 1.$$

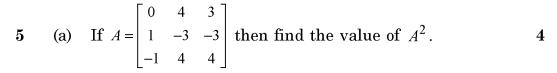
(c) Using truth table prove that  $(p \wedge q) \wedge r = p \wedge (q \wedge r)$ 

OR

4 (a) Using truth table prove that :  $\sim (p \vee q) = (\sim p) \wedge (\sim q)$ 

(b) Simplify the Boolean expression  $x + x' \cdot (x + y) + y \cdot z$ 

(c) Find the product sum cannonical form of  $f(x_1, x_2) = x_1 \cdot x_2 + x_1 \cdot x_2 + x_1 \cdot x_2$ 



(b) If 
$$A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & -1 \end{bmatrix}$$
 and  $B = \begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$  then find  $AB$ 

and BA. Is AB = BA?

(c) Solve the following system of equations using inverse of a matrix:

$$x+y+z=3$$
$$x+2y+3z=6$$
$$3x+y+2z=6$$

OR

5 (a) If 
$$A = \begin{bmatrix} -4 & -3 & -3 \\ 1 & 0 & 1 \\ 4 & 4 & 3 \end{bmatrix}$$
 then show that  $adj \cdot A = A$ .

(b) If 
$$A = \begin{bmatrix} 3 & 5 \\ 1 & 2 \end{bmatrix}$$
 and  $B = \begin{bmatrix} 4 & 5 \\ 3 & 4 \end{bmatrix}$  then verify that,  $(AB)^{-1} = B^{-1}A^{-1}$ .

(c) Solve the following equation using Cramer's rule : 
$$3x-2y+z=2$$
  
 $x+3y-2z=2$   
 $2x-y+z=2$ 

- 6 (a) Prove that (2, 3), (6, 5) and (12, 8) are collinear. 4
  - (b) Find the equation of a line passing through (4, 3) and making equal intercepts on the axes. Also find its slope.
  - (c) Find the equation of a line whose X-intercept is 3 and y-intercept is 5. Also find the slope of this line.

OR

**6** (a) Find 
$$k$$
 if  $A(3,6), B(-k,8)$  and  $C(1,2)$  are collinear.

(b) Prove that 
$$(2, -1)$$
,  $(3, 4)$ ,  $(-2, 3)$  and  $(-3, -2)$  are the vertices of a rhombus.

(c) If the line 
$$x-7y-2=0$$
 and  $kx+3y+1=0$  are a parallel then find the value of  $k$ .