



UA-3702

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

Time : Hours]

[Total Marks : 70

Instruction :

नीचे दृशवित्त निशा-नीवाणी विगतो उत्तरवली पर अवश्य वधवी. Fillup strictly the details of signs on your answer book.		Seat No. :
Name of the Examination :		<input type="text"/>
F. Y. B. C. A. (Sem. 1)		<input type="text"/>
Name of the Subject :		<input type="text"/>
102 - Mathematics		<input type="text"/>
Subject Code No. :	<input type="text"/> 3 <input type="text"/> 7 <input type="text"/> 0 <input type="text"/> 2	Section No. (1, 2,.....) : <input type="text"/> NIL
		Student's Signature

1 Answer the following questions :

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- (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 origin 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.

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[Contd.....

(b) Let $U = \{x | 3 \leq x \leq 13, x \in N\}$ 4

$$A = \{y | 1 < y < 8\}$$

$Z = \{z \in N | z^2 = 25\}$ then (1) find A' and B'

(2) Verify that, $A - (B \cup C) = (A - B) \cap (A - C)$

(c) If $A = \{x | x^2 - x - 2 = 0\}$ and 4

$B = \{x | x^2 - 5x + 6 = 0\}$ then find $A \cup B$ and $A \cap B$.

OR

2 (a) In usual notation prove that 4

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

(b) If $A = \{x | 1 < x < 10, x \text{ is an even number}\}$ 4

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

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

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

(c) If $U = \{x | x \in N, 1 < x < 10\}$ 4

$$A = \{x | 2 \leq x \leq 9\}$$

$B = \{3, 5, 6\}$ 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 4
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 $f(x) = \frac{x^2 - 25}{x - 5}$; $x \in Z - \{5\}$ and 4

$g(x) = x + 5$; $x \in Z$. Is $f(x) = g(x)$?

(c) If $f(x) = \frac{1}{x}$; $x \in Z - \{-1, 0, 1\}$ 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 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. Define $+$, \cdot & $'$ on D_9 as follow:

$$a + b = \text{lcm of } a \text{ \& } b$$

$$a \cdot b = \text{gcd of } a \text{ \& } b$$

$a' = 9/a$ then verify that $(D_9, +, \cdot, ', 1, 9)$ 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 canonical form of $f(x_1, x_2) = x_1 \cdot x_2' + x_1' \cdot x_2 + x_1' \cdot x_2'$

5 (a) If $A = \begin{bmatrix} 0 & 4 & 3 \\ 1 & -3 & -3 \\ -1 & 4 & 4 \end{bmatrix}$ then find the value of A^2 . 4

(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 $AB = BA$? 4

(c) Solve the following system of equations using inverse of a matrix : 4

$$\begin{aligned}x + y + z &= 3 \\x + 2y + 3z &= 6 \\3x + y + 2z &= 6\end{aligned}$$

OR

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

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

$$(AB)^{-1} = B^{-1}A^{-1}.$$

(c) Solve the following equation using Cramer's rule : 4

$$\begin{aligned}3x - 2y + z &= 2 \\x + 3y - 2z &= 2 \\2x - y + z &= 2\end{aligned}$$

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. 4

(c) Find the equation of a line whose X-intercept is 3 and y-intercept is 5. Also find the slope of this line. 4

OR

6 (a) Find k if $A(3, 6)$, $B(-k, 8)$ and $C(1, 2)$ are collinear. 4

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

(c) If the line $x - 7y - 2 = 0$ and $kx + 3y + 1 = 0$ are parallel then find the value of k . 4