A-3704

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

March/April - 2015

Paper : 102 - Mathematics

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 :
☛ First Year B. C. A. (Sem. I)
Name of the Subject :
☛ Paper : 102 - Mathematics
☛ Subject Code No. : 3 7 0 4 ☛ Section No. (1, 2,.....) : Nil

Seat No. :

Student's Signature

(2) Allquestions are compulsory.

(3) Figures to the right indicate full marks.

1 Answer the following questions : **10**

(1) Define power set with illustration.

(2) Explain Cartesian product of two non-empty sets with illustration.

(3) Define difference of two non-empty sets with illustration.

(4) Define one-one function with illustration.

(5) Find $f(-1)+f(2)$ for $f(x)=x^2-x+1$.

(6) Define Range of the function and find R_f for

$f(x)=x^3-x+2, D_f=\{-1,0,1\}$.

(7) Define symmetric matrix with illustration.

(8) Define singular and non-singular matrix with illustration.

(9) Define Duality in Boolean algebra.

(10) Define critical raw.

2 (a) State and prove Distributive law of union over intersection. 5

OR

(a) In usual notations prove that $A\times(B\cap C)=(A\times B)\cap(A\times C)$.

(b) Attempt any two : 5

(1) If $A=\{x\le 5; x\in N\}$, $B=\{x: x^2\le 4; x\in Z\}$ and $C=\{x; -1\le x\le 4; x\in N\}$ then verify $A\cap(B\cup C)=(A\cap B)\cup(A\cap C)$.

(2) If $A=\{x\le 3; x\in N\}$ $B=\{x: -1\le 2; x\in Z\}$ and $C=\{x: x^2-5x+6; x\in R\}$ considering U=R, verify DeMorgan's law for intersection.

(3) If $A=\{x/x\le 3; x\in N\}, B=\{x/2\le x\le 4, x\in N\}, c=\{1,3,4\}$ then prove that $A\times(B\cap C)=(A\times B)\cap(A\times C)$.

(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.

3 (a) If $f(x)=\dfrac{x(x-2)}{x-1}$ then find $f(0)+f(-1)+f(3)+f(2)$ 5

OR

(a) The supply function of a commodity is S=7 p–2 then find

(i) Supply when price P=250 Rs.

(ii) At what price the supply become 3540 units ?

3 (b) Attempt any two : 10

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

(2) It is observed that a quadratic function fits the data points (1,9), (2,14), (3,23).
Find the function and estimate y when $x=4$.

(3) Fixed cost of a factory producing particular types of bag is Rs. 9000 and the variable cost per bag is Rs. 110. If the selling price per bag is Rs. 240 then find profit function.

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

4 (a) Show that D_{15} is a Boolean Algebra where $\forall a, b, \in D_{15}$. 5

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

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

$a' = 15/a$

OR

(a) Prove that the argument in the following example is not logically valid.

$$\text{Hypothesis: } \begin{cases} S_1 : \wedge(\vee q) \Rightarrow r \\ S_2 : p \vee q \\ S_2 : q \Rightarrow p \end{cases} \quad \text{sonclusion : S : r}$$

(b) Attempt any two : 10

(1) Let $B = \{0.1\}$, prepare an input / output table for the Boolean function $f : B^2 \to B, f(x) = x_1 \bullet x_2^1$.

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

(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 show that $P \wedge (q \vee r) = (p \wedge q) \vee (p \wedge r)$.

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

OR

(a) If $A = \begin{bmatrix} 1 & 0 & 7 \\ 2 & 2 & 5 \\ 0 & 3 & 6 \end{bmatrix}$ then obtain adj. A and A × (adj.A) 5

(6) Attempt any two : 10

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

(2) Solve the following system of equations using Crammer's rule

$4x+10y=2xy$

$5x+16y=3xy$

(3) Show that D_9 is a Bollean Algebra where $\forall a,b \in D_9$.

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

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

$a'=9/a$

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