KA-3702-R

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

October / November – 2012

102 - Mathematics

(New Course)

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 :
☛ F.Y. B.C.A. (SEM. 1) (C.B.C.S.)

Name of the Subject :
☛ 102 - MATHEMATICS (NEW)

☛ Subject Code No. : 3 7 0 2 ☛ Section No. (1, 2,.....) : NIL

Seat No. :

Student's Signature

(2) All questions are compulsory.

(3) Figures to the right indicate full marks.

1 Objectives : **10**

(i) Write the no. of elements in the power set of a null set.

(ii) Define proper subset with illustration.

(iii) Define Onto function.

(iv) Define Demand Function.

(v) Define skew symmetric matrix with illustration.

(vi) Define equal matrices with illustration.

(vii) Define complainant of set with illustration.

(viii) Define Boolean Algebra

(ix) Define Boolean expression

(x) Define Minor and cofactor with illustration.

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

OR

(a) Prove that $n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B)$
$-n(B \cap C) - n(A \cap C) + n(A \cap B \cap C)$

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

(i) If $U=\{x \in N/1<x<10\}$, $A=\left\{x \in N/x^2<10\right\}$

$B = \{x \in N/x - 1 < 4\}$ then verify that

(a) $A' \cup B' = (A \cap B)'$

(b) $A' \cap B' = (A \cup B)'$

(ii) If $A=\left\{a/a^2-1<10; a \in z\right\}$

$B=\{b/|b-1|<2; b \in N\}$

$C=\{c/|c|<1;\ c \in Z\}$

Then prove that $A \times (B \cap C) = (A \times B) \cap (A \times C)$

(iii) A market research group conducted a survey of 2000 consumers and reported that 1720 consumers liked product P_1; and 1450 consumers liked product P_2. What is the least no. of consumer that must have liked both the products ?

(iv) If $A=\{2,3,4\}, B=\{x \in N/x<5\}, S=\{1,2,3\}$

$T = \{x \in N/x$ is add no. less than 7} then verify that $(A \times B) \cap (S \times T) = (A \cap S) \times (B \cap T)$

3 (a) Define function. Examine whether the following function are equal ? **5**

$f : R^+ \to R^+; f(x) = \sqrt{x^2}$

$g : R^+ \to R^+; g(x) = |x|$

OR

(a) A function is defined as

$f(x) = 2x+3;\ x \in [-2, 0]$

$= 4-3x;\ x \in (0, \infty)$

then obtain the value of $\dfrac{f(-2)-f(-1)}{f(2)+f(1)}$

(b) Attempt any two : 10

(i) If $f(x) = x^3$ and $g(x) = 3x^2 - 2x$ where $D_f = D_g = \{0,1,2\}$. If $f = g$? Justify your answer.

(ii) If $f(x) = x^2 + x - 1$ then prove that

$$f(x+1) - 3f(x) + 2f(x-1) = 2 - 2x$$

(iii) 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.

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

4 (a) Without Expanssian prove that **5**

$$\begin{vmatrix} 1 & a & b+c \\ 1 & b & c+a \\ 1 & c & a+b \end{vmatrix} = 0$$

OR

(a) Without expanssian prove that

$$\begin{vmatrix} 1 & x & yz \\ 1 & y & zx \\ 1 & z & xy \end{vmatrix} = (x-y)(y-z)(z-x)$$

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

(i) If $A = \begin{bmatrix} 2 & -1 & 0 \\ 0 & 4 & 3 \\ 2 & 1 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 4 & 1 & 3 \\ 2 & 0 & 5 \\ 1 & 3 & 0 \end{bmatrix}$ then prove

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

(ii) If $A = \begin{bmatrix} -1 & 3 & 5 \\ 1 & -3 & 5 \\ 1 & 3 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & -3 & 3 \\ -1 & 4 & 5 \\ 1 & -3 & -4 \end{bmatrix}$ then show

that $B^2 - A^2 = (B+A)(B-A)$

(iii) Solve by Crammer's rule

$2x+2y+z=4, \quad x+y+2z=1, \quad 3x+y+z=2$

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

5 (a) For any element x, y of a boolean algebra, prove that $x\cdot y'=0 \langle=\rangle x\cdot y=x$. 5

OR

(a) $D_{21}=\{1,3,7,21\}\ \forall x,y\in D_{21}$

$x+y = lcm$ of x, y

$x\cdot y = g.c.d$ of x, y

$x^1=21/x$

Show that D_{21} is a Boolean Algebra.

(b) Attempt any two : 10

(i) Find the product sum canonical form of

$f(x_1,x_2)=x_1\cdot x_2+x_1^1\cdot x_2+x_1\cdot x_2^1$

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

Hypothesis : $S_1: p\wedge(\sim q)\Rightarrow R$

$S_2: p\vee q$

$S_3: q\Rightarrow P$

Conclusion : S : r

(iii) Prove the distributive law :

(a) $P\wedge(q\vee r)=(P\wedge q)\vee(P\wedge r)$

(b) $P\vee(q\wedge r)=(P\vee q)\wedge(P\vee r)$

(iv) $\forall x,y\in B$ where B is a Boolean algebra, prove that $(x+y)'=x'\cdot y'$ and $(x\cdot y)'=x'+y'$.