N-1402

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

October / November – 2011

102 : Mathematics

Time : 3 Hours] [Total Marks : 100

Instruction :

(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. 1)
Name of the Subject :
☛ 102 : MATHEMATICS
☛ Subject Code No. : 1 4 0 2 ☛ Section No. (1, 2,.....) : Nil

Seat No. :

Student's Signature

1 Answer the following questions : 10

(1) Define subset of a set with illustration.

(2) If $A=\{1, 2, 3\}$ and $B=\{2, 4, 6\}$ then find $(A\cup B)-(A\cap B)$.

(3) Define Many one function.

(4) If f(x) = 5 x + 2 where $x\in R$ then find domain of f.

(5) If t is Tautology and p is a statement then prove that Pvt = t.

(6) If $\begin{vmatrix} 11 & 40 & 28 \\ 3 & 12 & 8 \\ A & 2 & 2 \end{vmatrix}=0$ then find the value of A.

(7) If $A=\begin{bmatrix} a & b \\ c & d \end{bmatrix}$ then find A^{-1}.

(8) In a Boolean algebra P.T. $x + x = x$.

(9) Find the value of k if $4x - ky - 7 = 0$ has the slope 3.

(10) Find the length of the line joining the points A (7, 8) and B (1, 0).

2 (a) State and prove distributive law of union over Inter section. 4

(b) If $A=\{1, 3, 4, 6\}$, $B=\{2, 4, 5\}$ and $C=\{3, 5, 6\}$ then verify that, $A\cap(B-C)=(A\cap B)-(A\cap C)$. 4

(c) In a college, there are 700 students and of them 300 have taken Mathematics and 250 have taken statistics. How many of them have taken both the subjects ? 4

OR

2 (a) State and prove De. Margan's law for union. 4

(b) If $A=\{a, c, e\}$, $B=\{b, d\}$ and $C=\{a, f, g\}$ then verify that $A\times(B-C)=(A\times B)-(A\times C)$. 4

(c) If $A=\{1, 2, 3\}$, $B=\{3, 4, 5, 6\}$ and $C=\{2, 6, 8\}$ then verify that, 4

(i) $A\cup B=(A-B)\cup B$

(ii) $A\cap(B-C)=(A\cap B)-(A\cap C)$.

3 (a) If $f(x)=\dfrac{x+1}{x^2-x+1}$ then find $f(2)+f(3)$. 4

(b) The demand function of computer is $d=f(p)=\sqrt{4850-SP}$. If the price of computer is Rs. 250. Then find the demand. At what price of computer demand will be zero ? 4

(c) Define domain and range of a function. 4

If $f: N\to N$, $f(x)=3x-2$ and range of a function is {1, 4, 7} then find domain of f.

OR

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

(b) If $f(x)=\dfrac{x^2-1}{x+5}$ then find $\dfrac{f(0)+f(1)}{f(2)+f(3)}$. 4

(c) It is observed that a quadratic function $y=ax^2+bx+c$ fits the data points (–1, 8), (1,4) and (2, 5) then find that function and estimate it when x = 2. 4

4 (a) Using truth table prove the following : 4

(i) $P\vee(P\wedge Q)=P$

(ii) $P\wedge(P\vee Q)=P$

(b) Let $D_{10} = \{1, 2, 5, 10\}$ $\forall$ $a, b \in D_{10}$. Define +, . and ' by 4

a + b = lcm of a and b
a . b = gcd of a and b

$a' = \frac{10}{a}$ then verify that,

$(D_{10}, +, \cdot, ', 1, 10)$ is a Boolean algebra.

(c) In a Boolean algebra prove that, 4

$x + (x \cdot y) = x$ and $x \cdot (x + y) = x$.

OR

4 (a) Prepare truth table for the following statements : 4

(i) $(p \vee q) \vee r$

(ii) $(\square\, p) \vee q$.

(b) Let $D_8 = \{1, 2, 4, 8\}$. Define +, · and ' by, 4

a + b = lcm of a and b
a · b = gcd of a and b
a' = 8/a then verify that,

$(D_8, +, \cdot, ', 1, 8)$ is not Boolean algebra.

(c) Construct input / output table for

$f(x_1, x_2, x_3) = (x_1 \cdot x_2)' \cdot x_3$.

5 (a) Solve the following equations by Cramer's rule : 4

$2x + 2y + z = 4$
$x + y + 2z = -1$
$3x + y + z = 2$.

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

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

(c) If $A = \begin{bmatrix} 2 & 5 & 2 \\ 3 & 4 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \end{bmatrix}$ then find AB 4

and BA.

OR

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

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

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

(c) Prove that $\begin{vmatrix}x & 1 & y+z\\ y & 1 & z+x\\ z & 1 & x+y\end{vmatrix}=0$.

6 (a) Show that $(-1, 3), (4, -7)$ and $(14, -2)$ are the vertices of an isosceles right angled triangle. 4

(b) If A (–1, 2), B (3,1) and C(1,5) are three vertices of a parallelogram, find the coordinate of its fourth vertex. 4

(c) Find the equation of a line which passes through the point of inter section of $5x + y + 4 = 0$ and $2x + 3y - 1 = 0$ and is perpendicular to $2x - y - 8 = 0$. 4

OR

6 (a) Find the equation of a line perpendicular to $5x + y + 2 = 0$ and passing through (3, 1). 4

(b) If the distance between A (–3, –2) and B (a, 1) is $3\sqrt{10}$ then find the value of a. 4

(c) Find the circumcentre of a triangle whose vertices are A (3, –2), B (4, 3) and C(–6, 5). 4
