DPP-2968

First Year B. Sc. (Sem. II) Examination

March / April - 2016

MCS - 201 : Mathematics for Computer Science

(Discrete Mathematics-II)

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. Sc. (Sem. II)**

Name of the Subject :
☛ MCS - 201 : Mathematics for Computer Science

☛ Subject Code No. : 2 9 6 8 ☛ Section No. (1, 2,.....) : Nil

Seat No. :

Student's Signature

(2) All the question are compulsory.

(3) Digits shown in the right hand side indicate full marks of the question.

(4) Symbols have their usual meaning.

1 Attempt any five : (Do as directed) **10**

(i) Suppose X is a set having 4 elements. Find the number of elements in $\mathcal{P}(X)$, the power set of X.

(ii) Specify the type of relation for $R=\{(1,2),(2,3),(3,4)\}$ defined on set $A=\{1,2,3,4\}$.

(iii) Suppose $A=\{x\in N | 2<x\leq 8\}$ and $B=\{x\in N | 0\leq x<8\}$. Determine $A\cup B$ and $A\cap B$.

(iv) Test the validity of $A\cup C=B\cup C\Rightarrow A=B$, If it is not true then give counter example.

(v) In the Boolean algebra B, show that $(x+y).x'.y'=0$

(vi) Let $A=\{1,2,3\}$, and "less than equal to" be the relation on A. Draw Hasse diagram of $(A,\leq)$.

(vii) Let U be a set of 10 elements, write bit string of the empty set and U.

2 (a) If $A=\{a,b\}, B=\{2,3\}$ and $C=\{3,4\}$ then find $A\times(B\cup C),(A\times B)\cup(A\times C)$ and show that $A\times(B\cup C)=(A\times B)\cup(A\times C)$. **5**

OR

(a) Construct the example to justify following

(i) $A\times B\neq B\times A$

(ii) $A\subseteq B\Rightarrow A\cup(B-A)=B$.

(b) Attempt any two **10**

(i) Let A,B,C be subsets of U then prove that $A\cap(B\cup C)=(A\cap B)\cup(A\cap C)$

(ii) 35 children of a class draw a map. 26 children use red colour and some children use yellow colour. If 19 use both the colours find the number of children who used the yellow colour.

(iii) If $U=\{a,b,c,d,e,f,g,\}$ $A=\{a,d,e,f\}$, $B=\{b,e,g\}$ and $C=\{a,c,e,g\}$ verify the following $A\times(B-C)=(A\times B)-(A\times C)$

(iv) Let A and B be two sets. Prove that $A-(A-B)=A\cap B$.

3 (a) Consider the relation $R=\{(i,j):\ |i-j|=2\}$ on $\{1,2,3,4,5,6\}$. Is R is transitive? Is R reflexive? Is R is symmetric?' **5**

OR

(a) Let $A=\{1,2,3,4\}$. If for $x,y\in A, R=\{(x,y)|\ x>y\}$ and $S=\{(x,y)|x+y=5\}$. Write R and S as sets and also find $R\cap S$.

(b) Attempt any two **10**

(i) Let $A=\{n\in Z \mid 1\le n\le 20\}$. Define R on A by xRy if and only if 5 divides x-y for all $x, y\in A$. Show that R is an equivalence relation on A.

(ii) Determine whether the relation $R=\{(x,y):|x-y|\le 7, \text{where } x,\ y \text{ are real numbers}\}$ is partial order relation or equivalence relation.

(iii) Consider the relation R from X to Y $X=\{1,2,3\};Y=\{7,8\}$ and $R=\{(1,7),(2,7),(1,8),(3,8)\}$ find inverse and complement of R

(iv) Let R be a relation on A. Prove that R is symmetric if and only if $R=R^{-1}$.

4 (a) Let $B=\{0,a,b,1\}$ be a set Addition multiplication and compliment operations are defined on B as per table below **5**

$+$	0	a	b	1
0	0	a	b	1
a	a	a	1	1
b	b	1	b	1
1	1	1	1	1

$\bullet$	0	a	b	1
0	0	0	0	0
a	0	a	0	a
b	0	0	b	b
1	0	a	b	1

$\vert$	
0	1
a	b
b	a
1	0

Show that $(B,+,\bullet,|)$ is a Boolean algebra

OR

(a) Prove that $x\vee(y\wedge x)=x$, where x,y are the elements of the Boolean algebra

(b) Attempt any two **10**

(i) Let $A=\{1,2,3,4\}$, consider the following relation R = $\{(1,1),(1,2),(1,3),(2,2),((3,2),(3,3),(4,2),(4,3),(4,4)\}$. Show that R is a partial order relation and draw it's Hasse diagram. Also find lub and glb of $\{1,4\}$.

(ii) If $(L, \precsim)$ is a lattice then for any $x. y \in L$, show that $x \precsim y \Rightarrow x \wedge y = x$

(iii) If a,b,c are elements of any Boolean algebra then prove that $(ba = ca) \wedge (ba' = ca')$ implies $b = c$

(iv) Draw the Hasse diagram of the poset $(A, \precsim)$, where $A = \{1,2,3,4,5\}$ and $x \precsim y$ iff x divides y. Determine lub and glb for the set $B = \{2,4,5\}$

5 (a) Simplify Boolean expression, $xyz + xy'z + xyz'$. **5**

OR

(a) If the set A has 32 elements, B has 42 elements, and $A \cup B$ has 62 elements, find the number of elements in $A \cap B$.

(b) Attempt any two **10**

(i) If $A = \{2,3,4\}$, $B = \{1,3,4\}$, $S = \{1,2,3\}$ and $T = \{1,3,5\}$, verify the following $(A \times B) \cap (S \times T) = (A \cap S) \times (B \cap T)$.

(ii) Find the lub and glb of $A = \{\{a,b\},\{b,c\}\}$, where A is a subset of power set of $A = \{a,b,c\}$ under the inclusion relation

(iii) Simplify the Boolean expression $x(x+y)(x+xy)$

(iv) Consider the poset $A = \{1,2,3,4,5,6\}$ with relation "divides". For the subset $B = \{3,6\}$ of A find, if exists lower bound, upper bound, glb and lub of B.
