CHRIST UNIVERSITY,BENGALURU - 560029

End Semester Examination March - 2015

Bachelor of Computer Applications II SEMESTER

Code: BCA232 **Max.Marks: 100**

Subject: BASIC DISCRETE MATHEMATICS **Duration: 3Hrs**

SECTION A

Answer any TEN questions **10X3=30**

1 Determine whether each of these pairs of sets are equal

i. {1,3,3,3,5,5,5,5} and {5,3,1}

ii. {{1}} and {1,{1}}

iii. ϕ **and {** ϕ **}**

2 Let $A=\{1,2,3\}$, $B=\{w, x, y, z\}$ and $C=\{9,10\}$. Find $B\times A$ and $A\times B\times C$.

3 Draw the graph of each of these functions :

i. $f(x) = \left\lceil \frac{x}{2} \right\rceil + \left\lfloor \frac{x}{2} \right\rfloor$

ii. $f(x) = \lfloor 2x+1 \rfloor$.

4 Draw the graph of each of these functions :

i. $f(x) = \left\lceil \frac{x}{2} \right\rceil \left\lfloor \frac{x}{2} \right\rfloor$

ii. $f(x) = \lceil 3x-2 \rceil$.

5 what are the terms a_1, a_2, a_3 of the sequence $\{a_n\}$,where a_n equals

i. $2^n + 1$

ii. $(n+1)^{n+1}$

6 Find atleast three different sequences beginning with terms 3,5,7 whose terms are generated by a simple rule or formula.

7 If A = $\begin{bmatrix} 2 & 5 & 1 \\ 0 & -1 & 3 \end{bmatrix}$, B = $\begin{bmatrix} 4 & -2 \\ 6 & 3 \\ 1 & 0 \end{bmatrix}$, C = $\begin{bmatrix} 1 \\ 3 \end{bmatrix}$ then verify A(BC) = (AB)C.

8 Find a, b, c given $\begin{bmatrix} a+3 & 3a-2b \\ -3a-c & a+b+c \end{bmatrix} = \begin{bmatrix} 2 & -7+2b \\ b+4 & 2a \end{bmatrix}$

9 Let $R_1=\{(a,b) \mid a \equiv b (\text{mod } 3)\}$ and $R_2=\{(a,b) \mid a \equiv b (\text{mod } 4)\}$ on the set of integers. Find

i. $R_1 - R_2$

ii. $R_2 - R_1$

10 If A ={0,1,2,3,4} & B = {0,1,2,3}, find the relation from A to B defined by *aRb* if and only if

i.b=a

ii.a+b=4

11 Define the following terms with an example.

i.Symmetric relation

ii.Anti-symmetric relation

12 Obtain the relation and then draw the directed graph for the following matrix

$$M_R = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix}$$

SECTION B

Answer any THREE questions **3X7=21**

13 **A survey of 500 television viewers of a sports channel produced the following information: 285 watch cricket, 195 watch hockey, 115 watch football, 45 watch cricket and football, 70 watch cricket and hockey, 50 watch hockey and football and 50 do not watch any of the three kinds of games.**

a) How many viewers in the survey watch all three kinds of games?

b) How many viewers watch exactly one of the sports?

14 (a) Define symmetric difference of two sets with an example.

(b) Draw the Venn diagrams for each of these combinations of the sets *A, B* and *C.*

i. $A \cap (B - C)$

ii. $(A - B) \cup (A - C) \cup (B - C)$

iii. $(A \cap B) \cup (A \cap C)$

15 (a)Define invertible function with example.

(b)Let f be a function defined from R to R defined by $f(x) = x^2$.Find

i. $f^{-1}(\{1\})$

ii. $f^{-1}(\{x \mid 0 < x < 1\})$

iii. $f^{-1}(\{x \mid x > 4\})$

16 (a) If $f : A \rightarrow B$ & $g : B \rightarrow C$ are two bijective mappings show that $(g \circ f)$ is a bijective mapping.

(b)Let $f : R \rightarrow R$ & $g : R \rightarrow R$ are mapping defined by $f(x) = x^2$, $g(x) = 2x - 1$ verify that $(g \circ f)^{-1} = f^{-1} \circ g^{-1}$.

SECTION C

Answer any four questions **4X7=28**

17 what are the terms a_1, a_2, a_3 of the sequence $\{a_n\}$,where a_n equals

i. $2^n + 1$

ii. $(n+1)^n$

iii. $(-2)^n$

18 (a) Show that a subset of a countable set is also countable

(b) Show that the union of two countable sets is also countable

19 $A = \begin{bmatrix} 2 & -5 & 8 \\ 3 & -6 & -7 \\ 4 & 0 & -1 \end{bmatrix}$,

Find f(A) = $A^3 - 2A^2 - 5I$,Where I is a 3x3 Identity matrix.

20 If $C = \begin{bmatrix} 11 & 36 & -4 \\ 7 & 97 & 71 \\ 25 & -5 & -26 \end{bmatrix}$, find C^3 and $f(C) = 2C^2 + 8C + 674I$. Where I is a 3x3 identity matrix.

21 $C = \begin{bmatrix} 5 & -3 & 14 \\ 20 & 16 & -5 \end{bmatrix}$, $D = \begin{bmatrix} 30 & 7 & -11 \\ 4 & -8 & 9 \end{bmatrix}$ Find $20C - 30D$, C^TD and D^TC.

SECTION D

Answer any three questions **3X7=21**

22 (a)Define the following with example: (i) Partial Ordering (ii) Poset.

(b)Which of these are posets?

i. (Z,=)

ii. (Z, $\neq$)

iii. (Z, $\geq$)

23 (a) Which of these relations on {0,1,2,3} are equivalence relations?

i. {(0,0),(1,1),(2,2),(3,3),(1,2),(2,1)}

ii. {(0,0),(0,2),(2,0),(2,3),(3,2),(3,3)}

iii. {(0,0),(1,1),(3,3),(1,2),(2,1)}

(b)Let R be the relation on the set of all sets of real numbers such that '*S R T*' if S and T have the same cardinality. Show that R is an equivalence relation.

24 Draw the Hasse diagram for divisibility on the set {2,3,5,10,11,15,25}.

25 Answer these questions for the poset({2,4,6,9,12,18,27,36,48},|)

i. Find the maximal elements.

ii. Find the minimal elements.