# CHRIST UNIVERSITY,BENGALURU - 560029

**End Semester Examination March - 2016**

**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 Define subset of a set.And find two sets A and B such that A $\in$ B and A $\subseteq$ B.

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

3 Define Surjective function. . Determine whether each of these functions from Z to Z is onto?
$i.\, f(a) = a^3$
$ii.\, f(a) = \lceil \frac{a}{2} \rceil$.

4 Determine whether each of these functions from Z to Z is one-to-one?
$i.\, f(a) = a^3$
$ii.\, f(a) = \lceil \frac{a}{2} \rceil$

5 Find atleast three different sequences beginning with terms 1,2,4 whose terms are generated by a simple rule or formula.

6 What are the values of these sums?

(i) $\sum_{i=0}^{4}(-2)^j$ (ii) $\sum_{j=0}^{8}(3.2^j - 2.3^j)$

7 If $A = \begin{bmatrix} 3 & 1 \\ 5 & 5 \end{bmatrix}$ prove that $A^2 - 8A + 13I = 0$.

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 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.a > b
ii.a | b

10 i. Define a binary relation.
ii. If A ={1,2,3,4} & B = {1,3,5}, find the relation from A to B defined by $aRb$ if and only if b - a is an odd number.

11 Define equivalence relation with example.
Which of these relations on {0,1,2,3} are equivalence relations?
i. {(0,0),(1,1),(2,2),(3,3)}
ii. {(0,0),(0,2),(2,0),(2,2),(2,3),(3,2),(3,3)}

12 Let R be the relation represented by the matrix $M_R = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$.Find the matrix representing $R^2$ and $R^3$.

## 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?
Also obtain the venn diagram.

14 For any three sets $A,B,C,$prove the distributive laws using set builder notation and logical equivalences.

15 (a) Suppose that $g$ is a function from $A$ to $B$ and $f$ is a function from $B$ to $C$. Show that if both f and g are one-to-one functions ,then $f \circ g$ is also one-to one.
(b) Find $f \circ g$ and $g \circ f$ where $f(x) = x^2 + 1$and $g(x) = x + 2$are functions from $R$ to $R$.

16 (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. $f^{-1}(x|0<x<1)$

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

## SECTION C

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

17 Determine whether each of these sets is countable or uncountable.For those that are countable,exhibit a one-to-one correspondence between the set of natural numbers and that set.

(i)Integers not divisible by 3

(ii)The even integers

18 Define the following terms with example.

(i)Finite sets and Infinite sets

(ii)Countable sets and Uncountable sets.

19 Find the inverse of $A=\begin{bmatrix}1&1&2\\1&2&5\\4&3&2\end{bmatrix}$ and $B=\begin{bmatrix}6&-1&7\\0&10&-1\\5&5&-3\end{bmatrix}$.Also find $B^{-1}A^{-1}$ .

20 If $A=\begin{bmatrix}6&-5&2\\5&-6&-9\\7&0&-1\end{bmatrix}$,Find $f(A) = A^3 - 7A^2 - 3I$, $g(A) = A^2 - 2A + 8I$. 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) 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.

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

(b)Which of these are posets?

i. (Z,=)

ii. (Z,$\neq$)

iii. (Z,$\geq$)

24 Construct the Hasse diagram for divisibility relation on the set {1, 2, 3, 6, 12, 24, 36, 48}.

25 Answer these questions for the poset({2,4,6,9,12,18,27,36,48,60,72},|)

i.Find the minimal elements.

ii. Find all lower bounds of {60,72}.