CHRIST UNIVERSITY,BENGALURU - 560029

End Semester Examination March - 2017

Bachelor of Computer Applications II SEMESTER

Code: BCA231 **Max.Marks: 100**

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

SECTION A

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

1 Prove that Â$|A \cup B$Â$| = $Â$|A$Â$| + $Â$|B$Â$| - $Â$|A \cap B$ÂÂ$|$.

2 (i) How many elements does the set $P(P(\phi))$ have ?

(ii)How many elements does the set $P(\{\phi, c, \{c\}, \{\{c\}\}\})$ have where c is a distinct element?

3 Define the following terms Function, Domain and Codomain with examples.

4 Find these values:

$i. \lceil \lfloor \frac{1}{2} \rfloor + \lceil \frac{1}{2} \rceil + \frac{1}{2} \rceil$

$ii. \lfloor \frac{1}{2} \times \lfloor \frac{5}{2} \rfloor \rfloor$

5 Find these terms of the sequence $\{a_n\}$, where $a_n = 2.(-3)^n + 5^n$

$i. a_0$

$ii. a_4$

$iii. a_5$

6 What are the values of these sums?

$$(i) \sum_{k=1}^{2} \sum_{j=1}^{3} (k+j)$$

$$(ii) \sum_{j=0}^{8} (3^j - 2^j)$$

7 If $A = \begin{bmatrix} 2 & -1 \\ 3 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ verify $(AB)^T = B^T A^T$.

8 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.

9 What do you mean by composition of relation? If $A = \{1, 2, 3, 4\}$ & R and S are relations on A defined by

$R = \{(1,2), (1,3), (2,4), (4,4)\}$ and

$S = \{(1,1), (1,2), (1,3), (1,4), (2,3), (2,4)\}$ find $R \circ S, S \circ R$.

10 Let $R_1 = \{(1,2), (2,3), (3,4)\}$ and

$R_2 = \{(1,1), (1,2), (2,1), (2,2), (2,3), (3,1), (3,2), (3,3), (3,4)\}$ be relations from $\{1,2,3\}$ to $\{1,2,3,4\}$. Find

i. $R_1 - R_2$

ii. $R_2 - R_1$

11 Define the following terms: Reflexive Closure, Symmetric closure and Transitive closure.

12 Represent each of these relations on $\{1, 2, 3, 4\}$ with a zero-one matrix:

i. $\{(1,2), (1,3), (1,4), (2,3), (2,4), (3,4)\}$.

ii. $\{(1,1), (1,2), (1,3), (2,2), (2,3), (3,3)\}$.

SECTION B

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

13 **Suppose that, in a certain examination, 200 students appear for mathematics, 50 appear for physics, 100 appear for chemistry, 20 appear for mathematics and physics, 60 appear for mathematics and chemistry, 35 appear for physics and chemistry, while 245 appear for**

mathematics or physics or chemistry.
(a)How many students appear for all the three of these subjects?
(b)How many students appear exactly for one of the subject?
Also obtain the venn diagram.

14 For any three sets A, B and C,prove that
(i) $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$
(ii) $A \cap (B \cap C) = (A \cap B) \cap C$
By using set builder notation.

15 (a) Define invertible function with example.
(b) Let f be a function defined from R to R defined by $f(x) = 2x + 1$. Find
i. $f^{-1}(1)$
ii. $f^{-1}(x|0 < x < 1)$
iii. $f^{-1}(x|x > 4)$

16 (a)Define Inverse function. If $f : A \to B$ is defined by $f(x) = \dfrac{x+3}{x-5}$ where $A = R - \{5\}$ & $B = R - \{1\}$,find the inverse of f, if it exists.
(b)If $f : A \to B$ is a bijective mapping then prove that $(f^{-1})^{-1} = f$

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

20 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 $B^{-1}A^{-1}$.

21 If $C = \begin{bmatrix} 1 & 3 & -4 \\ 7 & 9 & 7 \\ 2 & -5 & -2 \end{bmatrix}$,find C^3 and $f(C) = C^2$Â$-8C$Â$-34I$. Where I is a 3x3 identity matrix.

SECTION D

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

22 Let R be a relation defined on the set of ordered pairs of positive integers such that $((a,b),(c,d)) \in R$ if and only if $a + d = b + c$. Then show that R is an equivalence relation.

23 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. $\{(0,0),(1,1),(3,3),(1,2),(2,1)\}$

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

25 Find the minimal elements for the poset
$(\{2,4,6,9,12,18,27,36,48,60,72\},|)$.