[This question paper contains 8 printed pages]

Your Roll No. : .....

Sl. No. of Q. Paper : **2207** **IC**

Unique Paper Code : 32341202

Name of the Course : **B.Sc. (Hons.) Computer Science**

Name of the Paper : Discrete Structures

Semester : II

Time : 3 Hours ***Maximum Marks : 75***

Instructions for Candidates :

(a) Write your Roll No. on the top immediately on receipt of this question paper.

(b) Question **No. 1** is compulsory in **Section-A**.

(b) Attempt any **four** questions from **Section-B**.

(d) Parts of a question should be attempted together.

Section - A 35

1. (a) In a class of 50 students, there are 2 choices for optional subjects. It is found that 18 students have physics as an optional subject but not chemistry and 25 students have chemistry as an optional subjects but not physics. 5

P.T.O.

(i) How many students have both optional subjects ?

(ii) How many students have chemistry as an optional subject ?

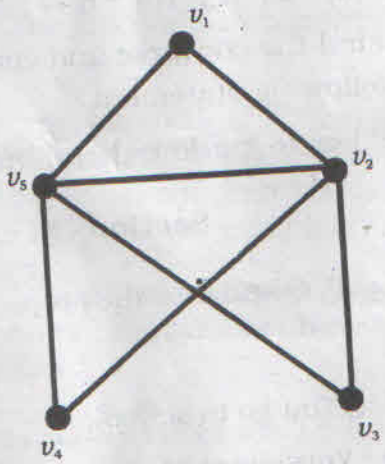
(iii) How many students have physics as an optional subject ?

(b) Given A = {1,2,4,5,10}. Find greatest lower bound and least upper bound for A. 4

(c) Eight chairs are numbered 1 to 8. Two women and three men are to occupy one chair each. First the women choose the chairs from amongst the chairs 1 to 4 and then men select from the remaining chairs. Find the number of possible arrangements. 4

(d) A graph has 12 edges, two vertices of degree 3, two vertices of degree 4, and other vertices of degree 5. Find the number of vertices in the graph. 3

(e) What is the condition for a graph G to have Euler Circuit ? Determine whether the given graph G has Euler circuit or not. Justify your answer. 4



Graph - G

(f) Sam received a yearly bonus and deposited Rs.10,000 in a local Bank yielding 7% interest compounded annually. Sam wants to know the total amount accumulated after n years. Determine the recurrence relation, initial conditions and total amount accumulated after 3 years. 4

P.T.O.

(g) Consider the function $f : R \to R$ and $g : R \to R$ defined by $f(x) = x^2+1$ and $g(x) = x+1$. Find $f \circ g$ and $g \circ f$. 4

(h) Use Master method to solve the given recurrence relation : 5

$T(n) = T(9n / 10) + n$

(i) Find the converse and contrapositive of the following statement : 2

If I go to market, then I buy a pen.

Section - B **40**

2. (a) Let P, Q and R be the propositions as follows : 3

P : You go to school.

Q : You appear in the exam.

R : You pass the exam.

Write the following statements in symbolic form :

(i) You do not go to school and you do not appear in the exam.

(ii) If you do not go to school and you do not appear in the exam, then you do not pass the exam.

(iii) You go to school and you appear in the exam, but you do not pass the exam.

(b) Consider the following statements : 5

Riya is preparing food. If Riya is preparing food then Riya is not going to school. If Riya is not going to school then her father does not make her take the examination.

Using the rules of inference prove "Riya's father does not make her take the examination."

(c) How many vertices does a full 5-ary tree with 100 internal vertices have ? 2

3. (a) Let a be the numeric function such that : 6

$$a_r = \begin{cases} 2 & 0 \le r \le 3 \\ 2^{-r} + 5 & r \ge 4 \end{cases}$$

Determine S^2 **a** and S^{-2} **a**

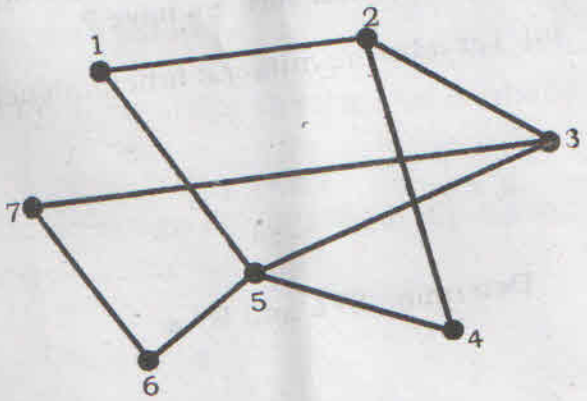
(b) Let A = {1,2,3,4} and B ={5,6,7,8}. A relation R from A to B is defined as x Ry if and only if $2x = y$ ($x \in A$, $y \in B$). Find the elements of R". 4

4. (a) Let A = {1,2,3}. Consider the relation R ={(1,1),(2,2),(2,3), (3,3),(3,2)}. 4

Determine the whether relation R is reflexive , symmetric, anti-symmetric or transitive.

(b) What is the chromatic number χ (Chi) of the complete bipartite graph Km , n and C_n where $n \geq 3$. 4

(c) Show that the given graph G is bipartite. Also find the bipartition of graph G : 2



5. (a) Determine the particular solution for the given difference equation : 5

$$a_n + 3\,a_{n-1} - 10\,a_{n-2} = n^2 + n + 1$$

(b) For the second order linear recurrence relation as follows : 5

$$a_r + a_{r-1} + a_{r-2} = 5$$

Given $a_0 = 2$, prove that fewer than 2 values of the numeric function will not be sufficient to determine the numeric function uniquely.

6. (a) (i) Define Big-O notation. 2

(ii) Use the definition of big–theta to prove that $7x^2 + 1 = \theta(x^2)$ 3

(b) Use the bubble sort to sort 6, 3, 5, 2, 1, 4, 8, 7 showing the lists obtained at each step. 5