Exam.Code:0915
Sub. Code: 6393

2123
B.E. (Computer Science and Engineering)
Third Semester
CS-303: Discrete Structures

Time allowed: 3 Hours **Max. Marks: 50**

*NOTE: Attempt **five** questions in all, including Question No. I which is compulsory and selecting two questions from each Section.*

x-x-x

1. (a) Permutation with Repetition
   (b) Logical implication
   (c) Partial order relation.
   (d) Closed Form Expression
   (e) Euler graph

   (5x2=10)

Section-A

2. (a) Show that if A and B are sets, then
   (i) $A - B = A \cap B^c$.
   (ii) $(A \cap B) \cup (A \cap B)^c = A$.
   (b) What can you say about the sets A and B if $A \oplus B = A$?
   (c) For any integer $n \geq 1$, prove that $1 + 1/\sqrt{2} + 1/\sqrt{3} + \ldots + 1/\sqrt{n} \geq \sqrt{n}$

   (3)
   (2)
   (5)

3. (a) State the converse, contrapositive and inverse of each of these conditional statements:
   (i) If it snows today, I will ski tomorrow.
   (ii) I come to class whenever there is going to be a quiz. (6)
   (b) Express each of these statements using quantifiers. Then form the negation of the statement, so that no negation is to the left of a quantifier. Next, express the negation in simple English. (Do not simply use the phrase "It is not the case that."):
   (i) Some old dogs can learn new tricks.
   (ii) No rabbit knows calculus.
   (iii) Every bird can fly.
   (iv) There is no one in this class who knows French and Russian. (4)

4. (a) Let R be the relation on the set of ordered pairs of positive integers such that $((a, b), (c, d)) \in R$ if and only if $a + d = b + c$. Show that R is an equivalence relation. (5)
   (b) Draw the Hasse diagram and find the lower bound, greatest lower bound, upper bound and the least upper bound of the sets{3, 9, 12} and {1, 2, 4, 5, 10}, if they exist, in the poset (Z+, |).
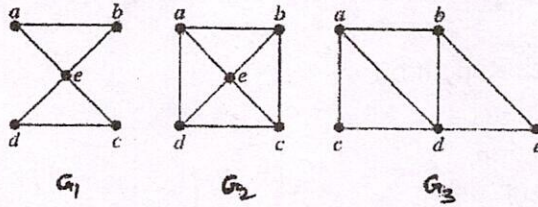   (5)

Section-B

5. (a) Solve the recurrence relation $a_k = 3a_{k-1}$ for $k \geq 1$ and initial condition $a_0 = 2$. (5)
   (b) Find the solution of the recurrence relation $a_n = 4a_{n-1} - 4a_{n-2} + (n + 1)2^n$. (5)

P.T.O.

6. (a) Discuss Breadth First Search traversal technique using a suitable example. **(6)**

(b) Which of the undirected graphs in the given figure have an Euler circuit? Of those that do not, which have an Euler path? **(4)**

G_1 G_2 G_3

7. (a) Suppose that there are 9 faculty members in the mathematics department and 11 in the computer science department. How many ways are there to select a committee to develop a discrete mathematics course at a school if the committee is to consist of three faculty members from the mathematics department and four from the computer science department? **(5)**

(b) Determine whether $(\{1, 2, 3, 4, 5\}, |)$ and $(\{1, 2, 4, 8, 16\}, |)$ are lattices. **(5)**

x-x-x