ROLL NO. _____

Code: CT22 Subject: DISCRETE MATHEMATICAL STRUCTURES

ALCCS

Time: 3 Hours **FEBRUARY 2014** **Max. Marks: 100**

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

NOTE:

- **Question 1 is compulsory and carries 28 marks. Answer any FOUR questions from the rest. Marks are indicated against each question.**
- **Parts of a question should be answered at the same place.**

Q.1 a. How many different 2-digit numbers can be made from the digits 0 to 9
(i) When repetition is allowed?
(ii) When repetition is not allowed?

b. Let R be an equivalence relation on the set A={4, 5, 6, 7} defined by R= {(4,4), (5,5), (6,6), (7,7), (4,6), (6,4)}. Determine its equivalence classes.

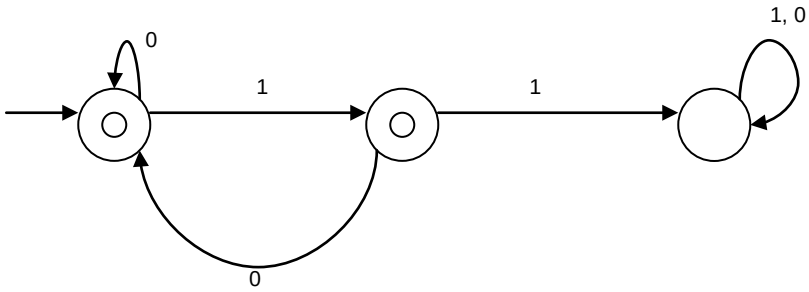
c. What is a complete bipartite graph? Draw the complete bipartite graph $K_{1,5}$.

d. Prove that the argument p→q, q→r, r→s, ~s, pVt is valid without using truth table.

e. Simplify the logical expression $\overline{XY} + \overline{X}Z + YZ + \overline{Y}Z\overline{W}$

f. State and prove the Euler formula to test the planarity of the graph.

g. What kind of strings is not accepted by the following automaton? Explain how. **(7 × 4)**



Q.2 a. Write the negation of each of the following in good English sentence.
(i) Jack did not eat fat, but he did eat broccoli
(ii) The weather is bad and I will not go to work.
(iii) Mary lost her lamb or the wolf ate the lamb.
(iv) I will not win the game or I will not enter the contest. **(9)**

b. Prove that ${}^{n+1}C_r = {}^{n}C_{r-1} + {}^{n}C_r$ **(9)**

Q.3 a. On a set S = {1,2,3,4,5}, find the equivalence relation on S, which generate the partition { {1,2}, {3}, {4,5} }. Draw the graph of the relation. **(9)**

b. How many different sub-committees can be formed each containing three women from an available set of 20 women and four men from an available set of 30 men? **(9)**

Q.4 a. State and prove the condition to find out if a given graph is an Euler graph. **(9)**

b. Define Boolean algebra. Prove that the power set of any set forma a Boolean algebra. **(9)**

Q.5 a. What is a Hasse diagram? Draw the Hasse diagrams of the following sets under the partial ordering relation "divides" and indicate those which are totally ordered.
(i) {2, 6, 24}
(ii) {1,2,3,6,12}
(iii) {3,9,27,54} **(9)**

b. Construct the finite automaton for the state transition table given below. **(9)**

	a	b
start s_0	s_0	s_2
s_1	s_0	s_1
s_{2*}	s_2	s_1

Q.6 a. Prove that if $(A, \leq)$ has a least element, then $(A, \leq)$ has a unique least element. **(9)**

b. Explain the ringsum, fusion and deletion operations on graphs giving suitable examples. **(9)**

Q.7 a. Write the Preorder, Inorder and Postorder tree traversal algorithm. **(9)**

b. Write down the Warshall's algorithm for the connectivity amongst the vertices of the graph. **(9)**