MAASAI MARA UNIVERSITY

REGULAR UNIVERSITY EXAMINATIONS
2018/2019 ACADEMIC YEAR
FIRST YEAR FIRST SEMESTER

SCHOOL OF SCIENCE AND INFORMATION SCIENCES

UNIVERSITY EXAMINATIONS FOR THE DEGREE OF BACHELOR OF SCIENCE (COMPUTER SCIENCE)

COURSE CODE: COM 1105
COURSE TITLE: DISCRETE STRUCTURE I

DATE: 11TH DECEMEBR 2018   **TIME: 11.00AM - 01.00PM**
INSTRUCTIONS
- Answer Question ONE and any other TWO

QUESTION 1 (30 Marks)

a) Draw the logical networks for

(i) $(a.\bar{b}) + (\bar{a}.b)$

(ii) $(a + b).(c + d)$ (4 Marks)

b) Consider the following three relations on the set A= {1, 2, 3}:

R= {(1, 1), (1, 2), (1, 3), (3, 3)}

S = {(1, 1), (1, 2), (2, 1), (2, 2), (3, 3)}

T = AXA

(i) Determine which of the relations are reflective.

(ii) Determine which of the relations are symmetric.

(iii) Determine which of the relations are transitive. (3 Marks)

c) The relation R on a set is represented by

$$M_R = \begin{bmatrix} 1 & 1 & 0 \\ 1 & 1 & 1 \\ 0 & 1 & 1 \end{bmatrix}$$

Find out whether R is reflexive, symmetric or antisymmetric? (6 Marks)

d) Draw the complete bipartite graphs $K_{2,3}$ (2 Marks)

e) Draw the relation graph for the following relations

(i) R ={(1,1),(1,3),(2,1),(2,3),(2,4),(3,1),(3,2),(4,1)} on the set X= {1,2,3,4}

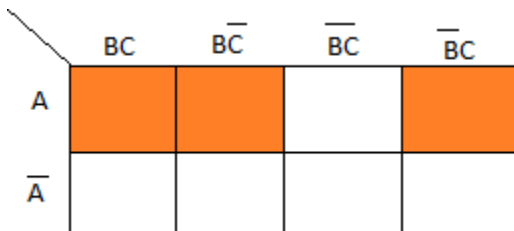(ii) S = {(1,1),(1,2),(1,3),(2,2),(2,3),(3,3)} on the set Y= {1,2,3} (3 Marks)

f) Use a K-map to find the minimal form for each of the following complete sum-of-products Boolean expressions and draw the logic circuit diagram.

$E_1 = ABC + AB\bar{C} + A\bar{B}C + \bar{A}BC + \bar{A}\bar{B}C$ (6 Marks)

g) Find the minimal form expression of K-Map given below:-

(2 Marks)

h) State the following:

(i) The principle of extension and

(ii) The principle of abstraction. (2 Marks)

i) Determine which of the following sets are finite.

    (i)   A={seasons in the year}

    (ii)   B= {+ve integers less than 1}   (2 Marks)

PART B

QUESTION 2 (20 Marks)

a) Consider the following sets:

        (I) $X = \{x: x \text{ is an integer}, x>1\}$

        (II) $Y = \{y: y \text{ is an positive integer, divisible by } 2\}$

        (III) $Z = \{z: z \text{ is an even number, greater than } 2\}$

Which of them are subset of w = {2, 4, 6.......}?   (3 Marks)

b) Determine the power set P (A) of A= {1, 3, 5}   (4 Marks)

c) Draw a Venn diagram of sets A, B, C where A and B have elements in common, B and C have elements in common, but A and C are disjoint.   (3 Marks)

d) Suppose U={1,2,3,........8,9},A= {1,2,3,4}, B={2,4,6,8}, and C={3,4,5,6}. Find

        (i) $(A \cup B) \cup C$ and   (ii) $A \cup (B \cup C)$ (4 Marks)

e) Determine which of the following sets are finite.

    (i)   A={seasons in the year}

    (ii)   B= {state in the union}

    (iii)   C={+ve integers less than 1}   (6 Marks)

QUESTION 3 (20 Marks)

a) Suppose U={1,2,3,........8,9},A= {1,2,3,4}, B={2,4,6,8}, and C={3,4,5,6}.

Find   (i) A^c

        (ii)   A\B

        (iii)   B\B   (3 Marks)

b) Draw the graph with the following adjacency matrix.   (3 Marks)

$$\begin{array}{c} \\ a \\ b \\ c \\ d \end{array} \begin{array}{cccc} a & b & c & d \\ \left[\begin{array}{cccc} 0 & 0 & 0 & 1 \\ 0 & 0 & 2 & 0 \\ 0 & 2 & 0 & 0 \\ 1 & 0 & 0 & 1 \end{array}\right] \end{array}$$

c) Prove the absorption laws: $A \cup (A \cap B) = A$ (4 Marks)

d) Let A = {1, 2, 3} and B = {a, b}. Find A×B (4 Marks)

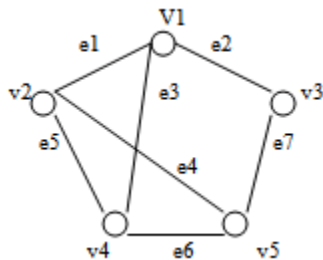e) Suppose the truth table of an expression is T= [A=00001111, B= 00110011, C= 01010101, L= 11101001

(i) Find out the Expression of given truth table.

(ii) Draw the K-Map and find the minimal form of this. (6 Marks)

QUESTION 4 (20 Marks)

a) Find the adjacency matrix A of the graph G in figure.

(4 Marks)

b) One hundred students were asked whether they had taken courses in any of the three areas, *Computer*, *Physics*, and *History*. The results were:

26 had taken *Computer*

22 had taken *Physics*

33 had taken *History*

6 had taken *Computer* and *Physics*

8 had taken *Computer* and *History*

5 had taken *History* and *Physics* and

2 had taken all the three courses.

(i) Draw a Venn diagram that will show the results of the survey. (2 Marks)

(ii) Determine the number of students who had taken exactly ONE of the courses. (2 Marks)

(iii) Number of Students who had taken exactly TWO of the courses. (2 Marks)

(iv) Number of Student who have taken NONE of the courses. (2 Marks)

c) Draw all trees with five vertices (5 Marks)

d) Draw the K-Map of the following expression. Z = f(A,B,C) = ABC + A$\overline{B}\overline{C}$ + $\overline{A}\overline{B}\overline{C}$+ AB$\overline{C}$ (3 Marks)

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