MAASAI MARA UNIVERSITY

REGULAR UNIVERSITY EXAMINATIONS
2019/2020 ACADEMIC YEAR
FIRST YEAR FIRST SEMESTER EXAMINATION

SCHOOL OF SCIENCE AND INFORMATION SCIENCES

UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE

(COMPUTER SCIENCE)

COURSE CODE: COM 1105

COURSE TITLE: DISCRETE STRUCTURE I

DATE: 4TH DECEMBER, 2019   **TIME: 08:30-10:30 AM**

INSTRUCTIONS
Answer Question **ONE** and any other **TWO**

Part-A
QUESTION 1 (30 Marks)
a) Give an example of each of the following:

    i)   A boolean expression in the sum of minterm form

    ii) A boolean expression in the non canonical form   **(4 Marks)**

b) Prove the following

A'B'C+A'BC+AB'C=A'C+B'C   **(8 Marks)**

c) 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)**

d) A group consists of nine men and six women. Find the number m of committees of six that can be selected from the class.   **(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}   **(4 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.

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

g) Simplify $\dfrac{(n+1)!}{(n-1)!}$ **(3 Marks)**

PART B

QUESTION 2 (20 Marks)

a) Consider the following sets:

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

        (II)   Y= {y: y is a positive integer, divisible by 2}

        (III)   Z= {z: z 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, 2, 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) Construct a truth table for the following statement form:
   p V (q ∧ (∼ p)) ↔((∼q) →p)   (**4 Marks**)

b) 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**)

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

$$\begin{array}{c c c c c} & a & b & c & d \\ a & \begin{bmatrix} 0 \\ 0 \\ 0 \\ 1 \end{bmatrix} & \begin{matrix} 0 \\ 0 \\ 2 \\ 0 \end{matrix} & \begin{matrix} 0 \\ 2 \\ 0 \\ 0 \end{matrix} & \begin{matrix} 1 \\ 0 \\ 0 \\ 1 \end{bmatrix} \end{array}$$

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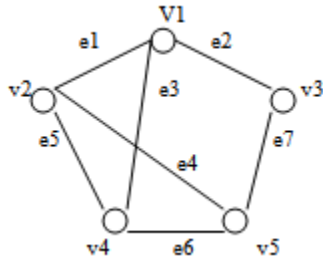
(**4 Marks**)

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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