MULTIMEDIA UNIVERSITY

ALTERNATIVE FINAL EXAMINATION

TRIMESTER 1, 2021/2022

DMA5301 – DISCRETE STRUCTURES
(CYBERJAYA)

20 NOVEMBER 2021
2.00 p.m – 4.00 p.m
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 2 pages only excluding the cover page.

2. Answer **ALL** questions and all necessary working steps **MUST** be shown.

3. Working steps have to be **handwritten**, not typewritten.

4. Before submitting, make sure you go through your work that it is **clear and tidy**.

5. Make sure you write your full name and ID number at the top of the word document.

6. Submit via Google Classroom in a single A4 **PDF** format.

7. Examiner reserves the right to penalize the marks if he/she found plagiarism in any form of submitted answers and/or solutions. (Rule No. 04: General Discipline of Students – Part III, Section 6)

<u>Question 1</u>   **[15 MARKS]**

a)   In how many distinct ways can the letters of $INDISCREETNESS$ be arranged?

                                                                (2 marks)

b)   What is the probability that Andre, Billy, Lara and Zack win the first, second, third and fourth prizes, respectively in a contest if there are 35 contestants and

        i.   no one can win more than one prize.   (1.5 marks)

        ii.   winning more than one prize is allowed.   (1.5 marks)

c)   Use Dijkstra's algorithm to find the length of a shortest path between vertex A to H.
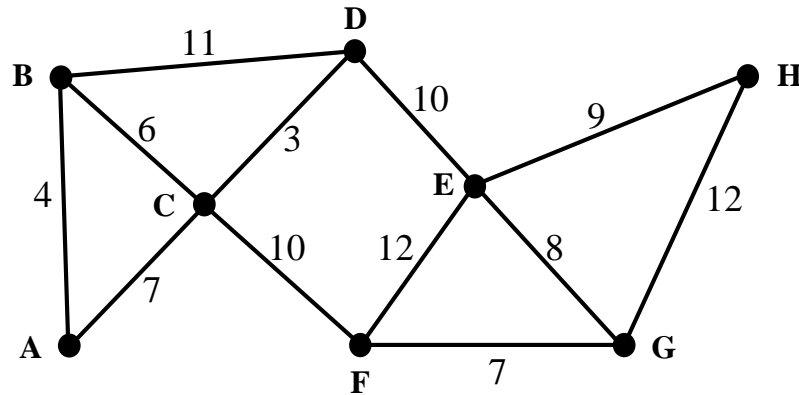
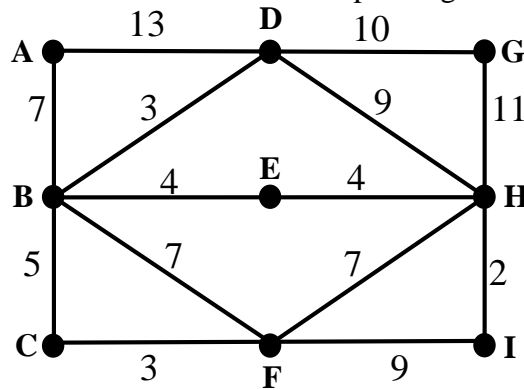   (5 marks)

d)   Study the adjacency matrix of a graph. How can you find the number of vertex, the number of edges, the degrees, and sum of degrees, without drawing the graph but just by using the entries of the matrix? You can explain by giving one example of adjacency matrix and describe how to get the answer without drawing the graph.

                                                                                 (5 marks)

<u>Question 2</u>   **[5 MARKS]**

a)   Create an example of a rooted tree that has a height which equal to 4.   (1 mark)

b)   Based on the rooted tree that you have drawn in Question 2(a), give an example for

        i.   siblings   (0.5 mark)

        ii.   ancestors   (0.5 mark)

        iii.   descendants   (0.5 mark)

        iv.   leaves   (0.5 mark)

        [Hint: choose one vertex from your rooted tree for each example]

c)   Use Kruskal's algorithm to find a minimum spanning tree for the given graph.
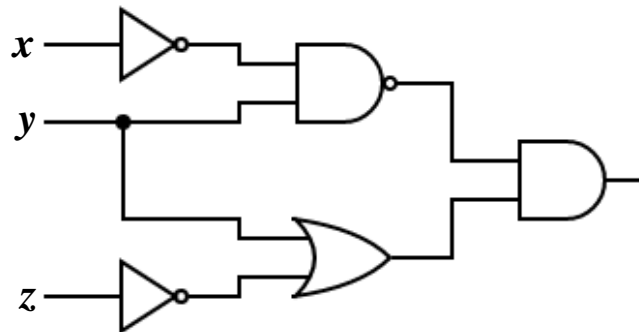

(2 marks)

Question 3   [10 MARKS]

a)   Find the final output of the given circuit below and construct the logic table from the output that you have identified.

(5 marks)

b)   Given a finite state automaton table (I, S, f, A, S_0): I = {p, q}, S = {S_0, S_1, S_2, S_3, S_4}, A = {S_0, S_3, S_4}.

I S	f	
	p	k
S_0	S_2	S_0
S_1	S_3	S_0
S_2	S_1	S_4
S_3	S_3	S_4
S_4	S_2	S_3

i.   Draw the transition diagram of a finite state automaton.   (4 marks)

ii.   Based on the transition diagram, find the output string for the given input string and determine whether the given string is accepted or not.

p p p p k k p   (1 mark)