



# UNIVERSITY OF MORATUWA

Faculty of Engineering

Department of Computer Science

B.Sc. Engineering

Semester 3 (18 Batch) Final Assessment

## CS 2150 Graph Theory for Computings

Time allowed: 1 hour

15th August, 2021

---

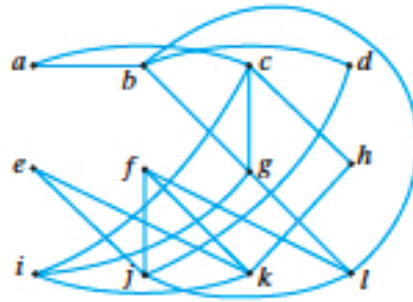
### INSTRUCTIONS

- This is an online assessment.
  - This assessment contains 2 questions on 3 pages.
  - Answer **ALL** questions and show all your work.
  - This assessment accounts for 35% of the module assessment.
  - You must show the work to get the full marks. Else, only 25% of the allocated marks will be given.
  - Please write down your answers in the papers, take clear images and upload them in the Moodle orderly only in jpg, png or pdf format
  - Start a new problem in a new page and number the pages.
  - The total maximum mark attainable is 50. The marks assigned for each question are indicated in square brackets.
  - Assume reasonable values for any data not given in or with the assessment. Clearly state such assumptions made on the script.
  - If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.
  - An hour is assigned to answer the questions and an additional 15 min is given to upload the answer script in the Moodle
-

### QUESTION 01

- (a) Determine whether the following graph is planar. If the graph is planar, redraw it ; otherwise, find a subgraph homeomorphic to either  $K_5$  or  $K_{3,3}$ . [5 marks]

Figure 1



- (b) The Table shown below gives distance in miles between six villages. Apply Kruskal's algorithm to find a minimum spanning tree. [8 marks]

Table 1

	A	B	C	D	E	F
A	—	5	6	12	4	7
B	5	—	11	3	2	5
C	6	11	—	8	6	6
D	12	3	8	—	7	9
E	4	2	6	7	—	8
F	7	5	6	9	8	—

- (c) A certain cooperation has 6 employees  $A, B, C, D, E$  and  $F$ . The boss need to meet with groups of employees to discuss a new overtime policy, but unfortunately some employees cannot stand to be in the same room with others. In following table, an  $X$  means that those two people cannot stand each other and cannot be in the same room together.

Make a graph with vertices the employees an edge between vertices if those employees hate each other. Determine the chromatic number of the graph.

[7 marks]

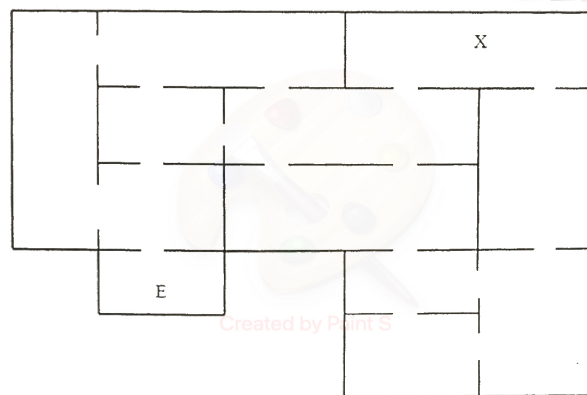
Table 2

	A	B	C	D	E	F
A		X			X	
B	X		X	X		X
C		X			X	
D		X			X	X
E	X		X	X		
F		X		X		

## QUESTION 02

- (a) The floor plan of a museum is given in the following diagram, where the entrance to the exhibits is labeled E.

Figure 2



- Draw a graph to represent the geography of the museum by representing each room as a vertex and each doorway as an edge. [4 marks]
  - Perform both a depth-first search and breadth-first search of the museum, with initial vertex  $E$  in both cases. [5 marks]
  - A visitor to the museum particularly wishes to see an exhibit in room  $X$ . Which of your two searches would you recommend to the visitor? [4 marks]
- (b) i. Represent the following expression in a binary tree.

$$[(A - B) \uparrow 2] / (A + B)$$

- Obtain in order and post order traversals of the above binary tree. [4 marks]
- (c) Form a Binary Search Tree for the following primary keys of a database in the given order.

15, 5, 4, 20, 16, 30, 11, 8, 25, 32

[4 marks]