



SECI1013: DISCRETE STRUCTURES

SESSION 2024/2025 – SEMESTER 1

ASSIGNMENT 3 (CHAPTER 3 AND 4)

INSTRUCTIONS:

1. This assignment must be conducted in a group (3 or 4 students). Please clearly write the group members name & matric number in the front-page of the submission.
2. Solutions for each question must be readable and neatly written on plain A4 paper. Every step or calculation should be properly shown. Failure to do so will result in rejection of the submission of assignment.
3. For submission, scan and combine all answer/solution sheets as one PDF file. Then only **ONE** group member needs to submit on behalf of the group via e-learning **(Refer deadline in elearning)**
4. This assignment has 70 marks contribute 5% of overall course marks.

STRUCTURES:

1. Chapter 3 (3.5): Probability [35 Marks]
2. Chapter 4 (4.1 to 4.6): Graph Theory [35 Marks]

Chapter 3 (3.5): Probability [35 Marks]

1. A student wants to take a book from the boxes that are kept in the store. There are four boxes stored according to their subject category. Suppose a math book is three times more likely to be taken out than a chemistry book. Chemistry books, on the other hand, are twice as likely as biology, and biology and physics are equally likely to be chosen.
[10 Marks]
 - i. What is the probability of being taken out for each subject? [5M]
 - ii. Calculate the probabilities that Mathematics or Biology is taken out by the student. [5M]
2. If A and B are events of mutually exclusive and $P(A) = 0.4$ and $P(B) = 0.5$, find:
[8 Marks]
 - i. $P(A \cup B)$
 - ii. $P(A^c)$
 - iii. $P(A^c \cap B)$
3. Assumed that there are 100 participants in a lucky draw competition. There are 3 prizes being offered which are the grand prize, second prize and third prize. The winners are randomly selected. What is the probability that Anis can win one of the prizes, if she participates in the competition?
[4 Marks]
4. The probability that a randomly chosen male has pneumonia problem is 0.40. Smoking has substantial adverse effects on the immune system, both locally and throughout the body. Evidence from several studies confirms that smoking is significantly associated with the development of bacterial and viral pneumonia. 80% of males who have pneumonia problem are smokers. Whilst 30% of males that do not have pneumonia problem are smokers.
[8 Marks]
 - i. What is the probability that a male is chosen do not have pneumonia problem? [4M]
 - ii. Determine the probability that a selected male has a pneumonia problem given that he is a smoker. [4M]
5. A store contains 1 pair of boots with each of the following colors are black, chocolate and yellow. Each pair is put together in a particular place. You enter into the dark store and pick randomly the boot without looking at it. Then, you replace it with another boots. What is the probability that you will choose the black pair of boots both times?
[5 Marks]

Chapter 4 (4.1 to 4.6): Graph Theory [35 Marks]

1. Explain the given keyword using your own word and represent your understanding by drawing the graph.
 - a. Vertices
 - b. Edges
 - c. Adjacent Vertices
 - d. Incident Edge
 - e. Isolated Vertex
 - f. Loop
 - g. Parallel Edges

(7 Marks)

2. Let $G = \{V, E\}$ be a graph. Draw a graph with the following specified properties
 - a. An undirect graph having $V = \{v_1, v_2, v_3, v_4, v_5, v_6, v_7, v_8, v_9\}$ and $E = \{e_1, e_2, e_3, e_4, e_5, e_6, e_7, e_8, e_9, e_{10}, e_{11}, e_{12}, e_{13}, e_{14}, e_{15}\}$. Where $e_1 = (v_1, v_2)$, $e_2 = (v_2, v_3)$, $e_3 = (v_2, v_5)$, $e_4 = (v_2, v_4)$, $e_5 = (v_4, v_6)$ and $e_6 = (v_5, v_6)$, $e_7 = (v_3, v_7)$, $e_8 = (v_6, v_7)$, $e_9 = (v_6, v_8)$, $e_{10} = (v_7, v_9)$, $e_{11} = (v_8, v_9)$, $e_{12} = (v_5, v_3)$, $e_{13} = (v_6, v_6)$, $e_{14} = (v_5, v_9)$ and $e_{15} = (v_9, v_9)$.
 - i. Find the degree of each vertex?
 - ii. Find the adjacent matrix and incident matrix?

(3 Marks)

- b. A direct graph having $V = \{v_1, v_2, v_3, v_4, v_5, v_6, v_7, v_8, v_9\}$ and $E = \{e_1, e_2, e_3, e_4, e_5, e_6, e_7, e_8, e_9, e_{10}, e_{11}, e_{12}, e_{13}, e_{14}, e_{15}\}$. Where $e_1 = (v_1, v_2)$, $e_2 = (v_2, v_3)$, $e_3 = (v_5, v_2)$, $e_4 = (v_2, v_4)$, $e_5 = (v_4, v_6)$ and $e_6 = (v_5, v_6)$, $e_7 = (v_3, v_7)$, $e_8 = (v_6, v_7)$, $e_9 = (v_8, v_6)$, $e_{10} = (v_7, v_9)$, $e_{11} = (v_9, v_8)$, $e_{12} = (v_3, v_5)$, $e_{13} = (v_6, v_6)$, $e_{14} = (v_9, v_5)$ and $e_{15} = (v_9, v_9)$.
 - i. Find the degree of each vertex?
 - ii. Find the adjacent matrix and incident matrix?

(3 Marks)

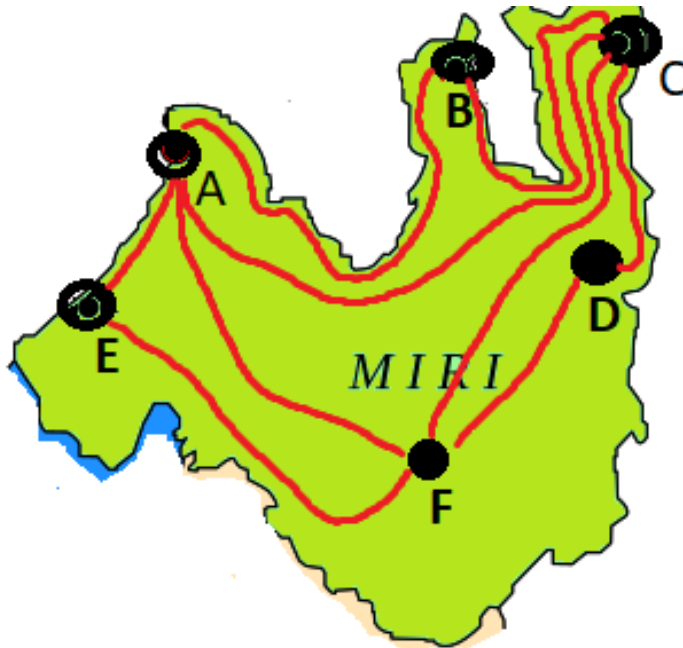
3. Draw an undirect graph for the following specified properties
 - a. A graph with three vertices having the degrees of vertices 1, 3 and 4
 - b. A simple graph with five vertices having the degrees of vertices 1, 3, 3, 3 and 4
 - c. A simple graph in which each vertex has degrees 3 and 6 edges.

(7 Marks)

4. An undirect graph having $V = \{v_1, v_2, v_3, v_4, v_5, v_6, v_7, v_8, v_9\}$ and $E = \{e_1, e_2, e_3, e_4, e_5, e_6, e_7, e_8, e_9, e_{10}, e_{11}, e_{12}\}$. Where $e_1 = (v_1, v_2)$, $e_2 = (v_2, v_8)$, $e_3 = (v_8, v_9)$, $e_4 = (v_1, v_3)$, $e_5 = (v_3, v_4)$ and $e_6 = (v_3, v_7)$, $e_7 = (v_7, v_6)$, $e_8 = (v_3, v_6)$, $e_9 = (v_4, v_5)$, $e_{10} = (v_6, v_9)$, $e_{11} = (v_5, v_8)$, $e_{12} = (v_5, v_9)$. From the graph;
 - i. Find all possible paths from v_1 to v_9 ?
 - ii. Find all possible trails from v_1 to v_9 ?
 - iii. Find the shortest and longest path from v_1 to v_9 ?
 - iv. Find the shortest longest trail from v_1 to v_9 ?

(7 Marks)

5. Given is the map of Miri Town in Sarawak. There is 6 main district that is connected by the main road in Miri.



- Find the possible Euler Path for this map?
- Find the possible Euler Circuit for this map?
- Find the possible Hamilton Circuit for this map?
- Explain what the difference between Euler Circuit and Hamilton Circuit is?

(8 Marks)