



**PENINSULA**  
**COLLEGE**  
GEORGETOWN DK266-03(P)

## FINAL EXAMINATION

Semester	:	<b>MAY 2024 SEMESTER</b>
Programme Name	:	<b>DIPLOMA IN COMPUTER SCIENCE</b>
Course Code & Name	:	<b>DCS1123 DISCRETE MATHEMATICS</b>
Duration	:	<b>3 HOURS</b>

### INSTRUCTIONS TO CANDIDATES:

1. Please read the instructions given in the question paper **CAREFULLY**.
2. The question paper consists of **FOUR (4)** questions.
3. Answer **ALL** questions in the question paper.
4. Answers to the questions are to be written into the examination booklet.
5. Electronic dictionaries, lecture notes, files or any unauthorised materials except writing equipment are strictly prohibited.

This question paper must be submitted along with all used and/or unused rough papers and/ or graph papers (if any). Candidates are **NOT ALLOWED** to take any examination paper(s) used or unused out of the examination hall.

### WARNING:

The Examination Board of Peninsula College Georgetown regards cheating as a very serious offence and will not hesitate to mete out the appropriate punitive actions according to the severity of the offence committed, and in accordance with the clauses stipulated in the Students' Handbook, up to and including expulsion from Peninsula College Georgetown.

*(This booklet contains 4 printed pages including this page)*

**DO NOT OPEN THIS BOOKLET UNTIL YOU ARE ALLOWED TO DO SO**

Answer **ALL** questions on the separate sheet provided.

[100 marks]

1. a) Given a directed graph,  $G = (V, E)$  where  $V$  is the set of vertices and  $E$  is the set of directed edges. The graph  $G$  has the following properties:

- The set of vertices  $V = \{A, B, C, D, E\}$
- The set of directed edges  $E = \{(A, B), (B, C), (C, D), (D, E), (E, A)\}$

Draw the directed graph  $G$ . (10 marks)

- b) Given an undirected graph  $H = (V, E)$  with the set of vertices such as  $V = \{A, B, C, D, E\}$ , but the edges are undirected. Hence, the set of undirected edges  $E = \{(A, B), (B, C), (C, D), (D, E), (E, A)\}$ .

Draw the undirected graph  $H$ . (10 marks)

- c) Based on your answer in **1(a)** and **1(b)**, explain in detail **ONE (1)** main difference between directed graph and undirected graph. (5 marks)

Total: [25 marks]

2. a) Let  $A = \{x \in \mathbb{Z} | -3 < x \leq 5\}$  and  $B = \{x \in \mathbb{Z} | 0 < x \leq 8\}$ . Consider the function  $f : A \rightarrow B$  defined by  $f(x) = x + 3$  for all  $x \in A$ .

i) Draw an arrow diagram of the functions  $f : A \rightarrow B$ . (5 marks)

ii) Find the inverse function if it exists. (2 marks)

- b) Assume that  $f$  and  $g$  be functions from the set of integers to the set of integers defined by  $f(x) = 2x + 3$  and  $g(x) = 3x + 2$ . Find the composition of:

i)  $f$  and  $g$  (3 marks)

ii)  $g$  and  $f$  (3 marks)

- c) Refer to the **Question 2(b)**, identify the first **FOUR (4)** terms of the sequence whose  $n^{\text{th}}$  term is given.

i)  $a_n = f(n), n \geq 1$  (5 marks)

ii)  $b_n = g \circ f(n), n \geq 1$  (5 marks)

- d) Based on the **Question 2(b)**, calculate  $\prod_{i=1}^6 g \circ f(x)$ . (2 marks)

Total: [25 marks]

3. a) **Question 3(a)** based on **Information 1**.

A group of 20 students have been trained to be programmer for the upcoming competition. The supervisor needs to select a group of 5 students to join the competition as the programmer.

**Information 1**

Calculate the number of ways to select a group of 5 students to join the competition as the programmer. (7 marks)

- b) **Question 3(b)** is based on **Information 2**.

Our Malaysian vehicle registration numbers are commonly arranged in term of 3 letters and 4 digits.

**Information 2**

Calculate the number of different ways the vehicle registration number can be arranged. (3 marks)

- c) **Question 3(c)** is based on **Information 3**.

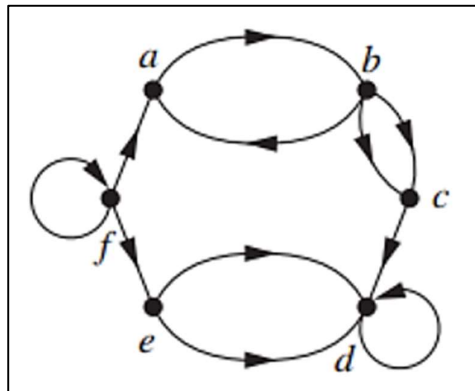
A football manager able to select 3 goalkeepers, 8 defenders, 7 midfielders, and 4 strikers.

**Information 3**

Find the number of possible teams he can pick with 1 goalkeeper, 4 defenders, 4 midfielders, and 2 strikers. (15 marks)

Total: [25 marks]

4. **Question 4(a) and 4(b)** are based on **Figure 1**.



**Figure 1**

- a) Identify the number of edges for each vertex listed in **Table 1**. (12 marks)

<b>Vertex</b>	<b>a</b>	<b>b</b>	<b>c</b>	<b>d</b>	<b>e</b>	<b>f</b>
$deg^-$	(i)	(iii)	(v)	(vii)	(ix)	(xi)
$deg^+$	(ii)	(iv)	(vi)	(viii)	(x)	(xii)

**Table 1**

- b) Based on **Figure 1**, prove that  $|E| = \sum deg^-(v) = \sum deg^+(v)$ . (10 marks)

- c) State **ONE (1)** difference between simple directed graph and directed multigraph. (3 marks)

Total: [25 marks]

**- END OF QUESTIONS -**