



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

## FINAL EXAMINATION

Semester	:	<b>JANUARY 2025 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) Based on answer in **1(a)**, convert the directed graph to undirected graph. (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. Question **2a)i)** until **2a)vii)** are based on **Figure 1**.

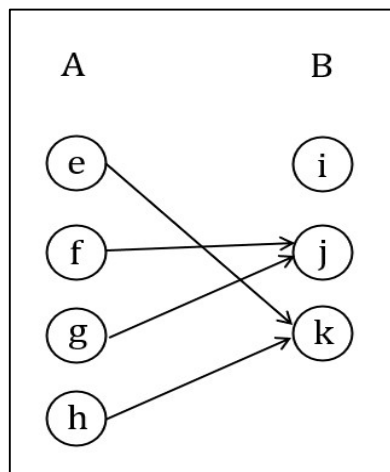


Figure 1

- a) Determine the following :

- i)  $f(A)$ . (2 marks)
- ii) image of  $f$ . (2 marks)
- iii) domain of  $f$ . (2 marks)
- iv) codomain of  $f$ . (2 marks)
- v)  $f(e)$ . (2 marks)
- vi) preimage(s) of  $k$ . (2 marks)
- vii)  $f\{e,g,h\}$ . (2 marks)

2. b) Let  $f$  be the function from  $\{a,b,c\}$  to  $\{1,2,3\}$  such that  $f(a) = 2$ ,  $f(b) = 3$ , and  $f(c) = 1$ . Find the inverse of function  $f$ . (6 marks)
- c) Let  $a = 6$  and  $r = 1/3$ , write the sequence of the first 5 numbers. (5 marks)
- Total: [25 marks]

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

A group of 20 candidates have been interviewed for IT analyst position. The employer needs to select a group of 5 candidates to join the company as the IT analysts.

**Information 1**

Calculate the number of ways to select a group of 5 candidates to join the company as the IT analyst. (7 marks)

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

The student IDs are commonly arranged in term of 3 letters and 4 digits.

**Information 2**

Calculate the number of different ways the student ID can be arranged. (3 marks)

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

A deputy dean able to select 3 HODs, 8 PLs, 7 assistant PLs, and 4 senior lecturers to conduct a workshop at TSC.

**Information 3**

Find the number of possible teams he can pick with 1 HOD, 4 PLs, 4 assistant PLs, and 2 senior lecturers. (15 marks)

Total: [25 marks]

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

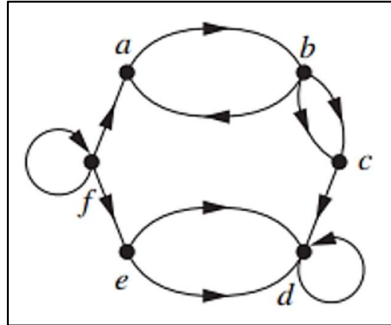


Figure 1

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

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

Table 1

b) Based on **Figure 1**, proof 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 -**