

The Open University of Sri Lanka
 B.Sc. in Information Technology Degree Programme
 ADU4230 – Discrete Mathematics II
 Final Examination - 2026/2027



Duration: Two hours

Date: 25-06-2026

Time: 09.30 a.m. – 11.30 a.m.

General Instructions

- Read all the instructions carefully before answering the questions.
- This paper consists of **TWO** sections; Section **A** and Section **B**. Section **A** is compulsory, and it consists of **FIVE** Structured Essay Questions.
- Section **B** consists of **FIVE** essay-type questions. Answer only **THREE** of them. Each question in Section **B** carries 100 marks.

SECTION A

Answer **ALL** Questions.

1.

- a) Find the values of x, y , and z for which the matrix

$$\begin{bmatrix} 2 & x & 3 \\ 4 & 5 & y \\ z & 1 & 7 \end{bmatrix}$$

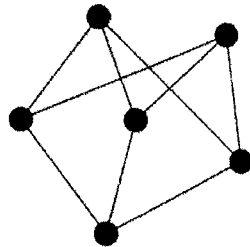
is symmetric.

- b) Find the solution for y in the following system.

$$\begin{aligned} 2x + 3y - z &= 1 \\ 3x + 5y + 2z &= 8 \\ x - 2y - 3z &= -1 \end{aligned}$$

- c) Determine whether the pair of integers (27,80) is relatively prime, by using Euclidean algorithm.

- d) Draw all non-isomorphic simple graphs with $|V(G)| = 3$.
- e) Determine the adjacency matrix corresponding to the following graph.



SECTION B

Answer **THREE** Questions **ONLY**.

2.

- a) Consider the following matrix.

$$A = \begin{bmatrix} 1 & 1 & 1 \\ 2 & 3 & 4 \\ 5 & 8 & 9 \end{bmatrix}.$$

- (i) Is the matrix A invertible? Justify your answer.
 - (ii) Find the adjoint matrix of A .
 - (iii) Based on your answer to part (i), if A is invertible, find inverse of A . Otherwise justify why inverse of A does not exist.
- b) Find the eigenvalues of the following matrix.

$$\begin{bmatrix} -2 & 0 & 0 \\ 11 & 5 & 0 \\ 6 & 8 & 13 \end{bmatrix}$$

3.

- a) Solve the following homogeneous system of linear equations using Gauss-Jordan Elimination method.

$$\begin{aligned}x + 2y + z &= 0 \\x + 2y + 3z &= 0 \\x + y + 5z &= 0\end{aligned}$$

- b) Solve the following system of equations using Cramer's rule.

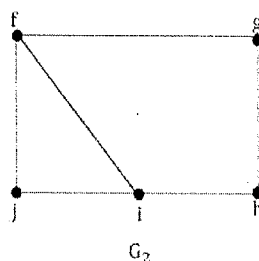
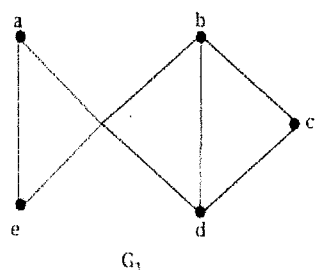
$$\begin{aligned}x + y + z &= 5 \\x - 2y - 3z &= -1 \\2x + y - z &= 3\end{aligned}$$

4.

- a) Find all solutions of the linear congruence $64x \equiv 12 \pmod{18}$
- b) Perform the following number-systems conversions.
- Convert $(735)_{16}$ into binary.
 - Convert $(379)_{10}$ into octal.
- c) Find the greatest common divisor of $(160, 25)$.

5.

- a) Construct the following graphs.
- The cubic graph Q_3 .
 - The Platonic graph of a tetrahedron
- b) Prove that the two graphs G_1 and G_2 are isomorphic.

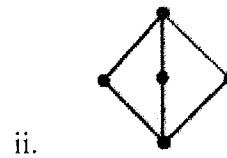
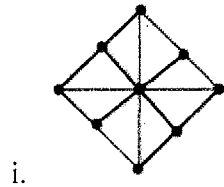


- c) Using Kuratowski's theorem, show that the Peterson graph is non-planar.

6.

a) Define a Hamiltonian graph.

b) Determine whether each of the following graphs is Hamiltonian, Semi-Hamiltonian, or Non-Hamiltonian. Justify your answer.



c) Using the Dijkstra's algorithm, find the shortest path from node *A* to node *J* in the graph given below.

