

Department of Software Engineering (SE)**Faculty of Science and Information Technology (FSIT)****Section: H****Set: A****Discrete Mathematics**

Time: 50 Minutes**Full Marks: 15**

[N.B. The figures in the margin indicate full marks and the symbols carry their usual meaning]

Question 1. Answer all parts.

1. Let G be the graph with vertex set $V = \{A, B, C, D, E\}$ and edge set $E = \{\{A,B\}, \{A,C\}, \{B,C\}, \{B,D\}, \{C,E\}, \{D,E\}\}$. Also let the relation R on the set $S = \{1, 2, 3, 4\}$ be defined by $R = \{(1,1), (2,2), (3,3), (4,4), (1,2), (2,1), (2,3), (3,2)\}$.

- (a) Write the adjacency matrix of graph G using the vertex order (A, B, C, D, E) . **[4 marks]**
- (b) Briefly explain two common graph representations. Which one is usually more space-efficient for a sparse graph? **[3 marks]**
- (c) Determine whether G is a bipartite graph. Give a reason for your answer. **[3 marks]**
- (d) Determine whether G contains a Hamilton path. If it does, write one such path. **[2 marks]**
- (e) For the relation R , determine whether it is reflexive, symmetric, and transitive. **[3 marks]**