PE424001 Algorithm and Data Structure
Revision

Q1. (10 Marks) Answer the following questions using Figure 1

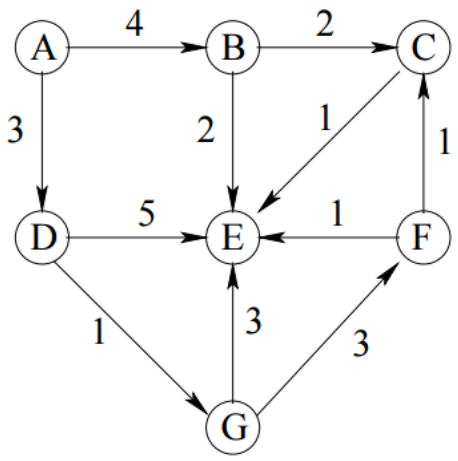

Figure 1 A directed graph

a) Construct the corresponding adjacency matrix of Figure 1 (2 Marks)
b) What is the main disadvantage of using matrix to form the graph relationship? (1 Mark)
c) Execute Dijkstra's algorithm on the graph of Figure 1 starting at vertex A. It is noted that each vertex MUST be visited at least once. (3 Marks)
d) What is the shortest path from A to F. Show the route. (1 Marks)

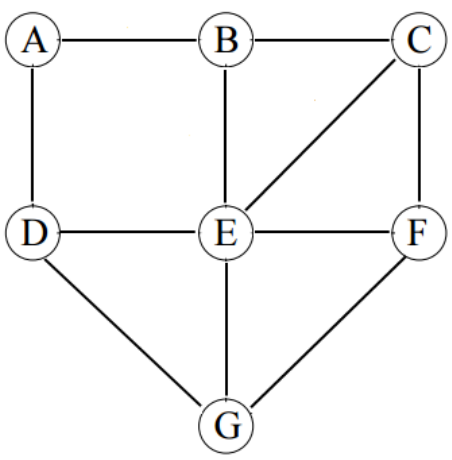

Figure 2 An undirected graph

e) An undirected version is shown in Figure 2. Use Depth-First search traverse the graph (from node A) and illustrate the steps using proper data structure. (3 Marks)

Q2. (9 Marks) Given the following data sequence.

[35, 20, 38, 16, 31, 40, 10, 22, 34]

a) Draw the binary search tree formed by entering the data in the order and assign a balancing factor in each node. (4 Marks)

b) Using the tree above, give the preorder scan of the nodes. (1 Marks)
c) Using the tree above, give the inorder scan the nodes. (1 Marks)
d) Using the tree above, give the postorder scan the nodes. (1 Marks)
e) Reform the tree into AVL tree after inserting node 30 and put the balancing factor in each node. (2 Marks)

Q3a) Construct a Binary Search Tree (BST) by inserting the following keys (from left to right): The tree initially is empty. key ={17, 9, 26, 12, 11, 7, 30, 20, 21, 10} (2.5 Marks)

b) By using the BST from question Q3a, draw the BST after the key 17 is deleted (1 Marks)

Q4. a) Convert 2*3/(2-1)+5*3 into Postfix form

b) Evaluate the following expression, showing the state of the stack at each step.

6 5 ∗ 7 3 − 4 8 + ∗ +

Q5 Given the frequency of the following symbols:

	a	b	c	d	e	f	g
Frequency	37	18	29	13	30	17	6

a) What is the total bits if we use fixed-length coding?
b) Construct a Huffman tree and write down the final code words of each symbol.
c) What is the total bits in part b) and How much you save (in %)?
d) Based on part b) result, decode the message 1101110111000010

6) Perform Quicksort of the following sequence and write down the first partition numbers on left and right hand side of the pivot value.

Pivot value= 57