COMP2012 (Fall 2022) Discrete Mathematics

Individual Assignment 2 Due Date: 23:59, 28th November, 2022

Name	
Student number	

Notes:

- This is an **individual** assignment.
- Please submit the **soft copy** of your answer to Blackboard (as a doc/docx/pdf file).
- You just need to write your answer. There is no need to copy questions.

Question 1.

1(a) **[10 marks]**
Draw the binary search tree that results from inserting the numbers below starting with 70 and ending with 63.

70 11 47 81 20 61 10 12 13 63

1(b) **[5 marks]**
Determine the root and leaves of the tree

1(c) **[3 marks]**
Is it a balanced tree? Why?

1(d) **[5 marks]**
List nodes in an *inorder traversal*

1(e) **[5 marks]**
List nodes in a *preorder traversal*

1(f) **[5 marks]**
List nodes in a *postorder traversal*

1(g) **[5 marks]**
Insert 15 to the tree, list all nodes it will visit

1(h) **[6 marks]**
(Without inserting 15), delete 11 from the tree and draw the resulting tree

1(i) **[6 marks]**
Delete 47 after deleting 11 and draw the resulting tree

Question 2.

2(a) **[10 marks]**
The roads represented by the graph shown in Figure 2 are all unpaved. The lengths of the roads between pairs of towns are represented by edge weights. Which roads should be paved so that there is a path of paved roads between each pair of towns so that a minimum road length is paved? (Hint: Use the Kruskal algorithm)

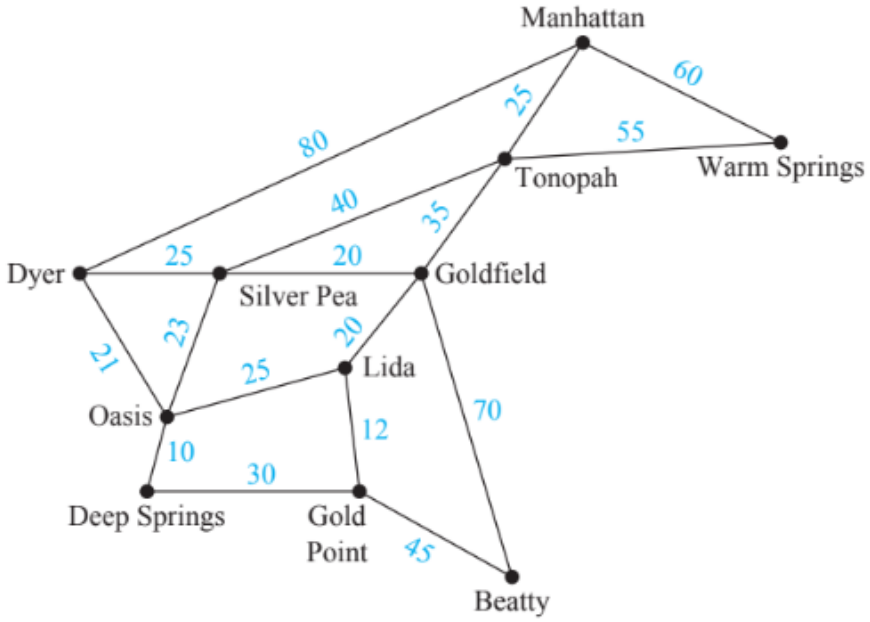

Figure 2

Question 3.

3(a) **[8 marks]**

Write down the logical expression of the given circuit in Figure 3.

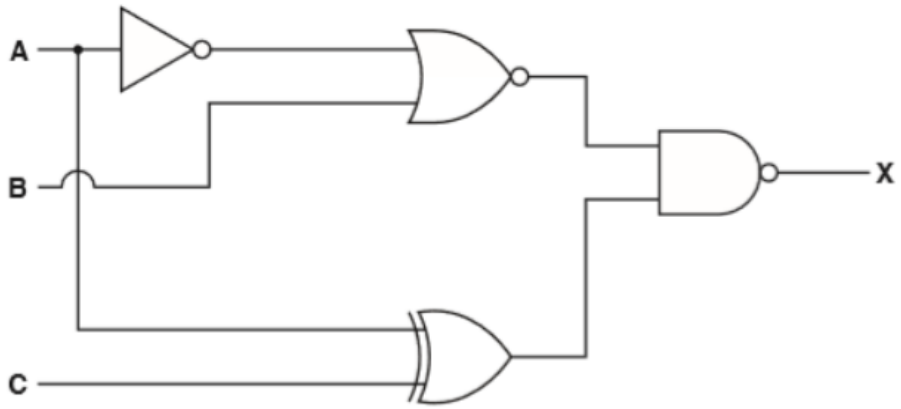

Figure 3

3(b) **[12 marks]**

Complete the truth table for all possibilities of A,B,C

Question 4.

Figure 4 shows the campus map of the Hong Kong Polytechnic University:

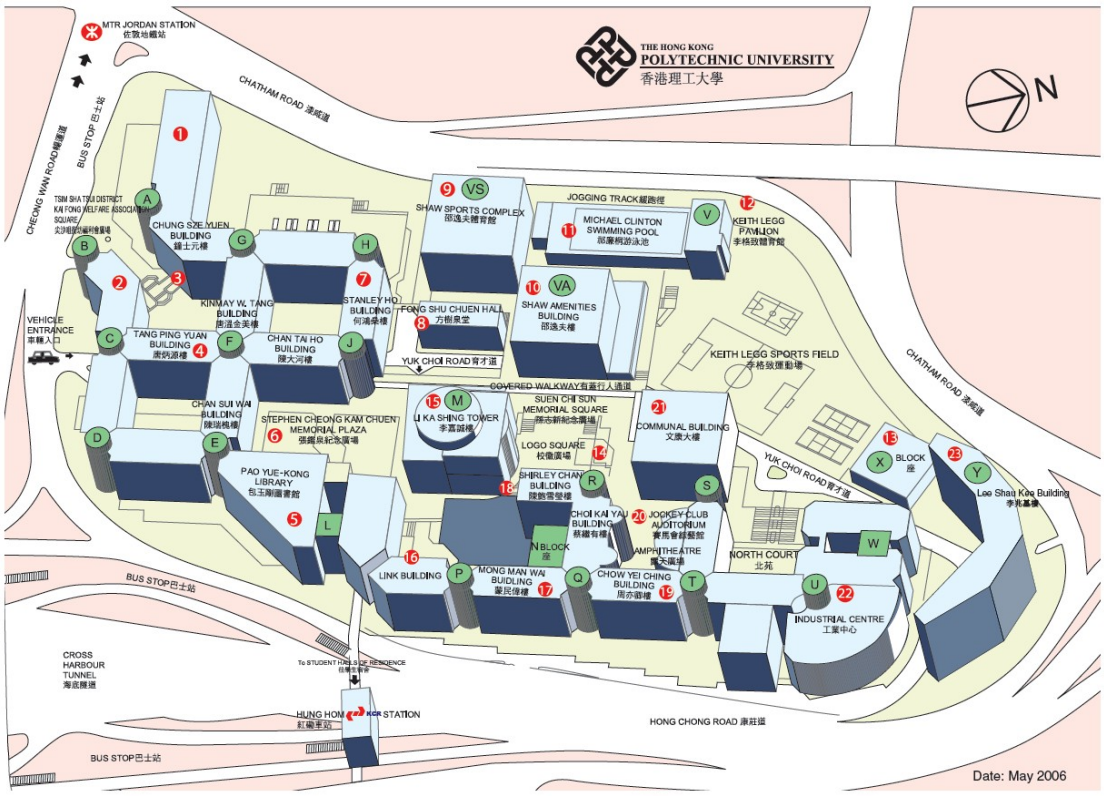

Figure 4

We define the distances between Cores/Blocks/Towers:

M to R: 150 metres, Q to R: 100 metres, Q to M: 185 metres, Q to T: 100 metres
R to S: 100 metres, S to T: 100 metres, T to W: 115 metres, S to W: 122 metres
T to U: 100 metres, U to W: 55 metres, W to Y: 61 metres. U to Y: 83 metres
M to VA: 112 metres, R to VA: 171 metres, S to VA: 202 metres

4(a) **[15 marks]**

Start from Core Q, find the lowest cost distances to the buildings/towers and show the steps (9 marks). And then, write down the lowest cost distances from Core Q to the following landmarks:

(i) Tower M (2 marks)
(ii) Classroom Y302 (2 marks)
(iii) 7-Eleven (2 marks)

4(b) **[5 marks]**

Write down the shortest path from Core Q to Classroom Y302 in order to attend the COMP2012 lecture.

End of Assignment 2