THE UNIVERSITY OF TRINIDAD & TOBAGO

FINAL ASSESSMENT/EXAMINATION APRIL/MAY 2016

Course Code and Title: DSAL3001- Algorithm Analysis and Design

Programme: Bachelor of Applied Science in Computer Engineering

Date and Time: Monday 18th April 2016 9:00 a.m. – 12:00 noon **Duration: 3 Hours.**

PLEASE READ ALL INSTRUCTIONS CAREFULLY BEFORE YOU BEGIN THIS EXAMINATION

Instructions to Candidates

1. This paper has _5_ pages and _15__questions.
2. You are required to answer all questions.
3. You are required to return the question script.

Key Examination Protocol

1. Students please note that academic dishonesty (or cheating) includes but is not limited to plagiarism, collusion, falsification, replication, taking unauthorised notes or devices into an examination, obtaining an unauthorised copy of the examination paper, communicating or trying to communicate with another candidate during the examination, and being a party to impersonation in relation to an examination.
2. The above mentioned and any other actions which compromise the integrity of the academic evaluation process will be fully investigated and addressed in accordance with UTT's academic regulations.
3. Please be reminded that speaking without the Invigilator's permission is **NOT** allowed.

8. Which of the following case does not exist in complexity theory
a. Best case
b. Worst case
c. Average case
d. Null case

9. The complexity of Binary search algorithm is
a. O(n)
b. O(log)
c. $O(n^2)$
d. O(n log n)

10. The complexity of Insertion sort algorithm is
a. O(n)
b. O(log n)
c. $O(n^2)$
d. O(n log n)

SECTION B: 80 marks

All questions are mandatory and are to be answered in your answer booklet.

11. Indicate (by placing either yes or no in the blanks), for each pair of expressions (A, B) in the table below, whether A is O, o, Ω, ω, or θ of B. Assume that $k \geq 1$, $\varepsilon > 0$, and $c > 1$ are constants. (Note: Students are to reproduce the table in their answer booklets)

A	B	O	o	Ω	ω	Θ
$lg^k n$	n^{ε}					
n^k	c^n					
$\sqrt{n}$	$n^{\sin n}$					
2^n	$2^{n/2}$					
$n^{\lg c}$	$c^{\lg n}$					
lg(n!)	$lg(n^n)$					

[15 marks]

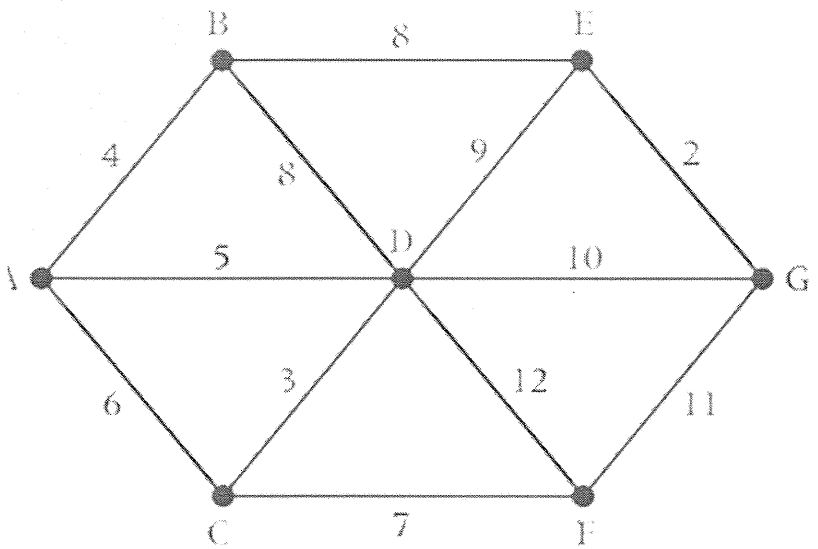
12. Given two strings x, and y, we need to find their longest common subsequence (LCS), i.e. the longest sequence of characters that appear left-to-right, but not necessarily in a contiguous block, in both strings.

a. Determine an LCS of x = (1, 0, 0, 1, 0, 1, 0, 1) and y = (0, 1, 0, 1, 1, 0, 1, 1, 0). Draw a table to show how you derived your answer. [10 marks]

b. We use PRINT-LCS(b, x, 9, 8) to construct an LCS of x, y from b. We follow the path of arrows from b[9, 8]; whenever we encounter a d in entry b[i, j] it implies that $x_i = y_j$ is an element of the LCS. Draw a table showing the arrows produced by the algorithm and give the LCS of x and y. [8 marks]

13. Find the minimum spanning tree (give the length) for the network below, showing the order in which edges are selected:
For example: Kruskal
XY 2
YZ 6

(a) using Kruskal's algorithm,
(b) using Prim's algorithm starting from A.

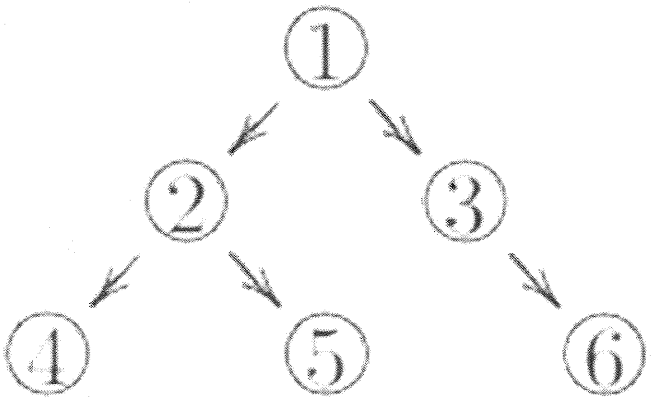


[15 marks]

14. (a) Briefly describe the breadth-first and the depth-first search for trees.

[7 marks]

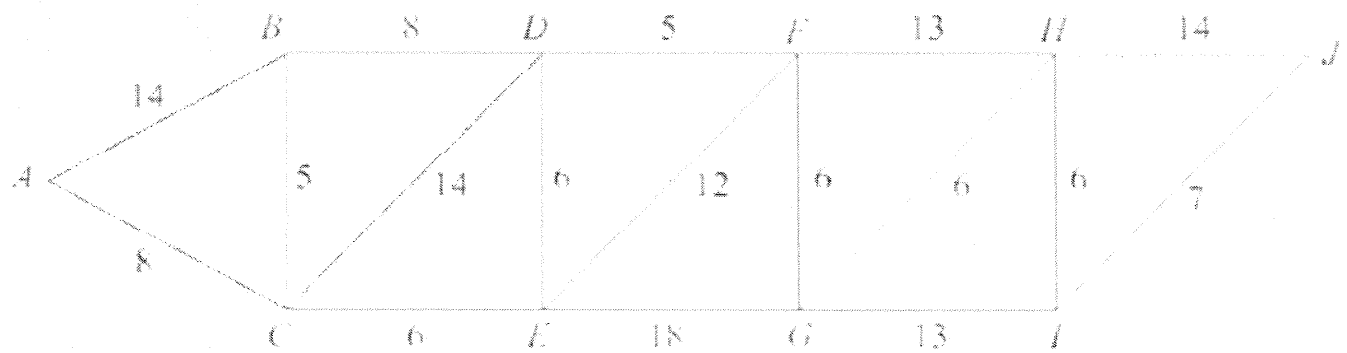
(b) Consider the following graph:



Starting at the root node 1, give the order in which the nodes will be visited by the breadth-first and depth-first algorithms.

[10 marks]

15. The network shows the times, in minutes, to travel between 10 towns.



(a) Use Dijkstra's algorithm to find the minimum time to travel from A to J.

[10 marks]

(b) State the corresponding route.

[5 marks]

END OF EXAMINATIONS