CSE 2DMO **Discrete Mathematics** **Assignment 3, 2007**

This assignment is due on WEDNESDAY May 30th at 5pm.

Statement of Originality. Your assignment must begin with the following statement which must be signed and dated by you:

DECLARATION: *This assignment has not been copied at all or in part from other students' work.*

Name: _____

Signature: _____ **Date:** _____

1. Use Kruskal's Algorithm to find a minimal spanning tree for the graph with:

Vertices: v_1 v_2 v_3 v_4 v_5 v_6

Edges: v_1v_3 v_1v_4 v_1v_5 v_1v_6 v_2v_3 v_2v_4 v_2v_5 v_3v_6 v_4v_5 v_5v_6

Weights: 1 8 9 4 10 2 5 6 3 7

(The edges and weights are listed in corresponding order.)

$e_1 =$ ..... $e_2 =$ ..... $e_3 =$ ..... $e_4 =$ ..... $e_5 =$ .....

$e_6 =$ ..... $e_7 =$ ..... $e_8 =$ ..... $e_9 =$ ..... $e_{10} =$ .....

	$N(1)$	$N(2)$	$N(3)$	$N(4)$	$N(5)$	$N(6)$	Edges	Weight
Initially	1	2	3	4	5	6	$\varnothing$	0

ANSWER:

The edge set for the minimal spanning tree consists of edges:

.....

The weight of the minimal spanning tree is: .....

2. (a) Use QUICK Sort to write down the lists for Pass 1, Pass 2 and Pass 3. Use a star to indicate any sorted elements of the list. Use a box to indicate any unsorted sub-lists. Use an arrow to indicate the pivot element(s) in each pass. You should use the first element of any list or sub-list as the pivot element.

List to be sorted	After Pass 1	After Pass 2	After Pass 3
→ Hash			
Insert			
Bubble			
Quick			
Select			
Merge			
Binary			

(b) Referring to (a) above, complete the following table.

	Pass 1	Pass 2	Pass 3
Number of Comparisons			

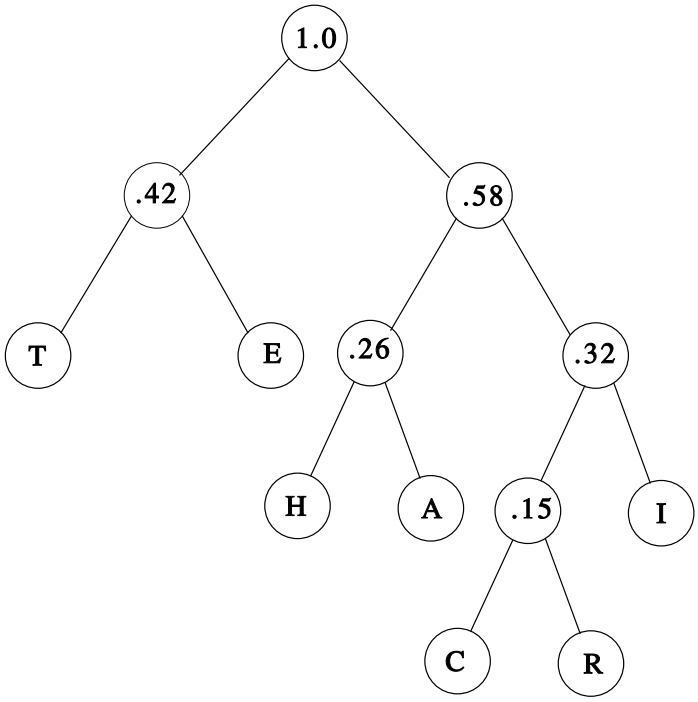
3. (a) Label the branches of the tree below to create a Huffman code and fill in the table below.

(b) Encode: **I T E R A T E**

(c) Decode: 1100100101110110111000001110 1

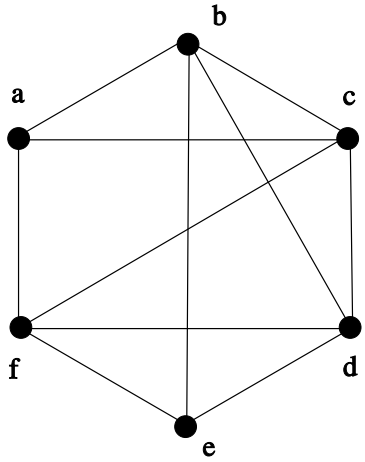
(d) Decode: 1011101110010011100011100 00

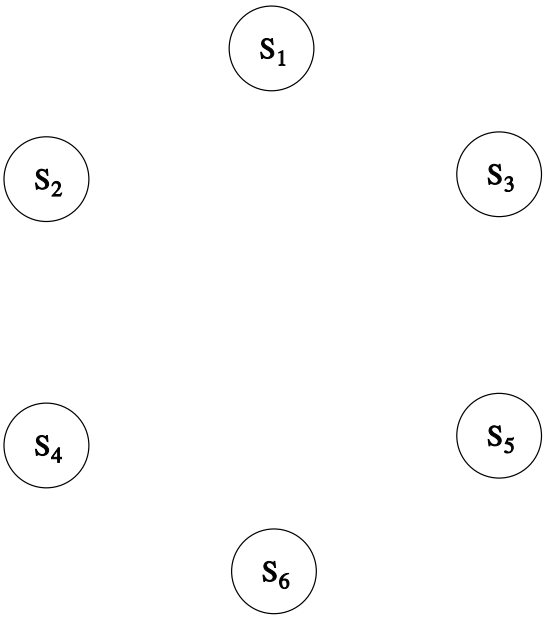
CHARACTER	CODE
A	
C	
E	
H	
I	
R	
T	



4. Use Fleury's algorithm to find an eulerian path for Graph 1.

Graph 1





5. Consider the finite state machine given by the table below.

state table	0	1
S_1	S_3	S_2
S_2	S_1	S_4
S_3	S_3	S_3
S_4	S_3	S_6
S_5	S_3	S_3
S_6	S_3	S_5

initial state: S_2
acceptor state: S_5

(a) Complete the state diagram using the layout on the right above.
(b) Describe the language accepted by this machine.
(c) Construct a finite state machine which accepts only the following two words: 101, 1001 .

6. This question deals with Finite State Machines.

INPUT LANGUAGE: Strings of 0's and 1's

LANGUAGE TO BE ACCEPTED: Strings which end with at least four 1's.

(a) Write the language to be accepted as a set.

(b) Create a finite state machine which accepts the above language.