By providing my signature below I acknowledge that this is my own work, and I did not get any help from anyone else:

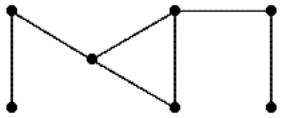
Name (sign): _____ Name (print): _____

Student Number: _____

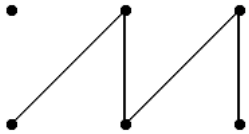
Problem Number	Points Possible	Points Made
1	12	
2	10	
3	24	
4	22	
5	32	
Total:	100	

- This test is 8 pages long. Make sure you have all 8 pages.
- Notice that Question 5 is worth a third of the points.
- If you need extra space use the last page.
- Please show your work. **An unjustified answer may receive little or no credit.**
- Your work must be **neat**. If I can't read it (or can't find it), I can't grade it.
- Please turn off your mobile phone.
- Calculators are prohibited.

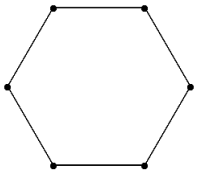
1. This question concerns the following graphs, referred to as A, B, C, D, E, and F. For each part, circle all correct answers. (There may be more than one.)



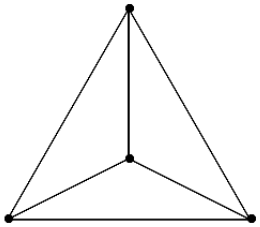
A



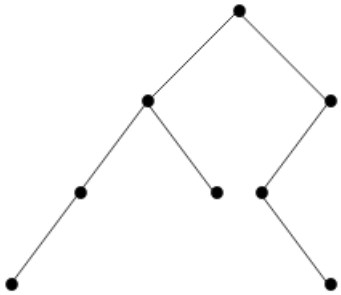
B



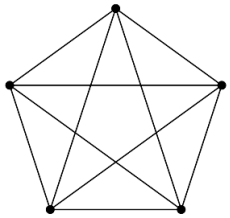
C



D



E



F

(a) (2 pts) Which of these graphs is connected?

A B C D E F

(b) (2 pts) Which of these graphs is a complete graph?

A B C D E F

(c) (2 pts) Which of these graphs is two-colorable?

A B C D E F

(d) (2 pts) Which of these graphs has an Euler circuit?

A B C D E F

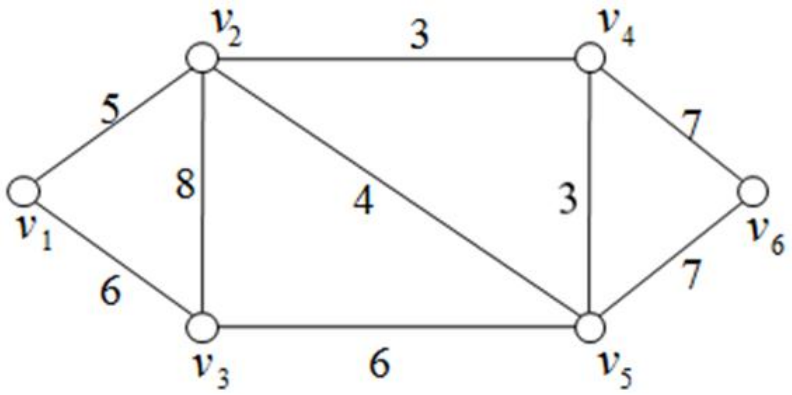
(e) (2 pts) Which of these graphs is a tree?

A B C D E F

(f) (2 pts) Which of these graphs has a spanning tree which is a connected graph?

A B C D E F

2. Answer the following True/False questions regarding this graph. No justification is necessary.



(a) (2 pts) _____ The sequence $v_1 \to v_2 \to v_3 \to v_4 \to v_5 \to v_6$ is a path.

(b) (2 pts) _____ The sequence $v_1 \to v_2 \to v_3 \to v_4 \to v_5 \to v_6 \to v_1$ is a circuit.

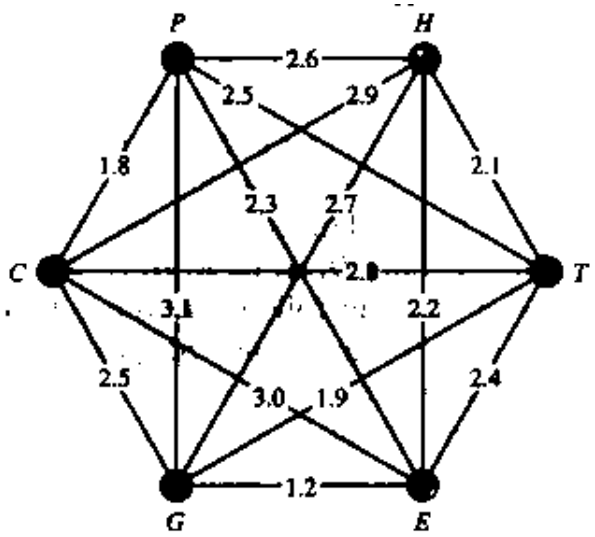
(c) (2 pts) _____ The sequence $v_1 \to v_2 \to v_4 \to v_6 \to v_5 \to v_3 \to v_1$ is an Euler circuit.

(d) (2 pts) _____ The sequence $v_1 \to v_2 \to v_4 \to v_6 \to v_5 \to v_3 \to v_1$ is an Hamiltonian circuit.

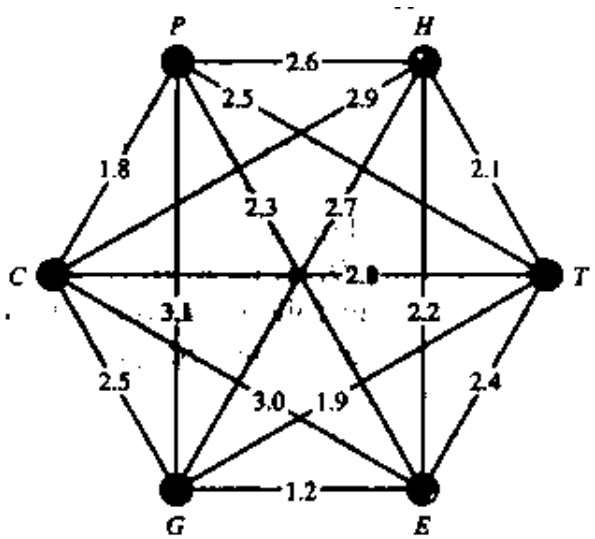
(e) (2 pts) _____ This graph has a spanning tree whose vertex set is exactly the vertices $v_1,\ v_2,\ v_3,\ v_4$, and v_5.

3. This entire question deals with one graph, which has been reproduced multiple times below for your convenience.

   (a) (12 pts) Apply the nearest-neighbor algorithm, starting at vertex H, to find a Hamiltonian circuit in the following graph. (You do not need to find the cost.)

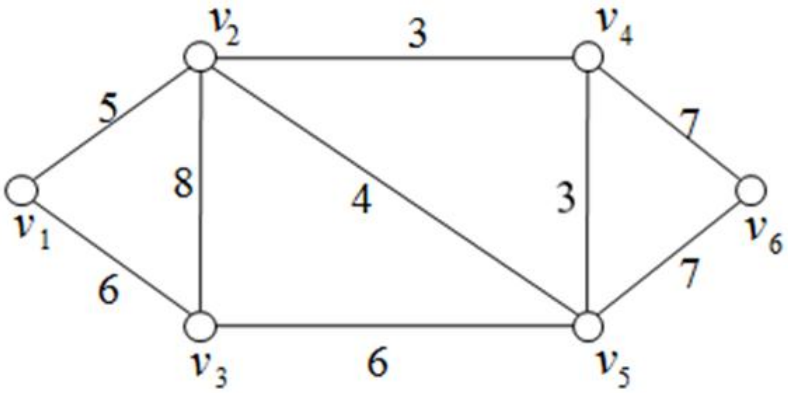


   (b) (12 pts) Apply the sorted-edges algorithm to find a Hamiltonian circuit in the following graph. (You do not need to find the cost.)

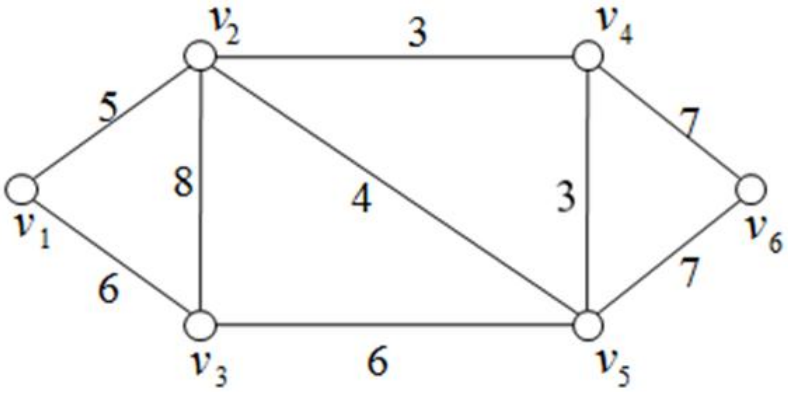


4. This entire question deals with one graph, which has been produced multiple times below for your convenience.

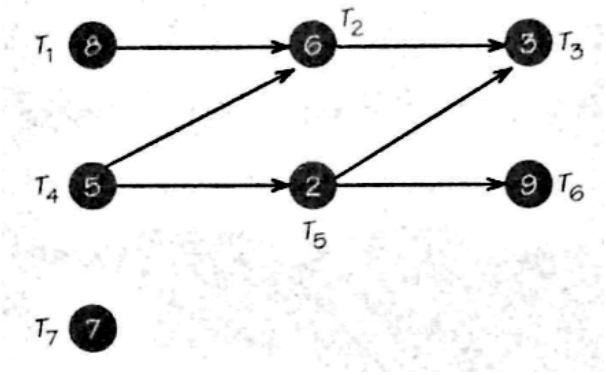
   (a) (11 pts) Use Kruskal's algorithm to find a minimum-weight spanning tree in the following graph.



   (b) (11 pts) Find a 3-coloring of the following graph, using colored pencils/pens/markers or numerical labels.



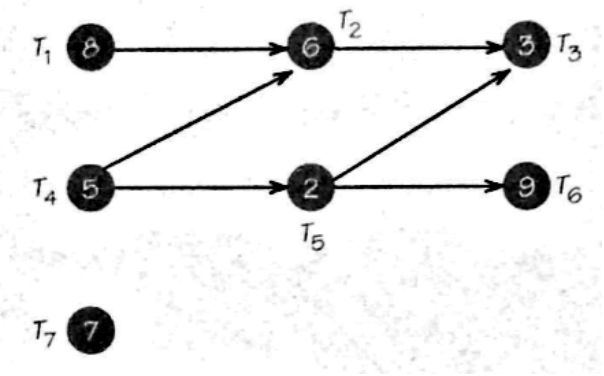
5. This question uses the following order-requirement digraph.



(a) (5 pts) List the critical path(s) of the above order requirement digraph. (To list a directed path, just list the tasks. e.g., $T_4 \to T_5 \to T_3$ would be a path, as would T_7.)

(b) (12 pts) Apply the critical-path algorithm to the above order-requirement digraph to obtain a priority list.

(c) (13 pts) Apply the list-processing algorithm to the order-requirement digraph (reproduced below for your convenience) using the priority list $T_2,\ T_4,\ T_6,\ T_1,\ T_3,\ T_5,\ T_7$ to schedule this job on *two* processors.



(d) (2 pts) How long does the job described in (c) take to complete?

____ / 15 points

Extra space for work.