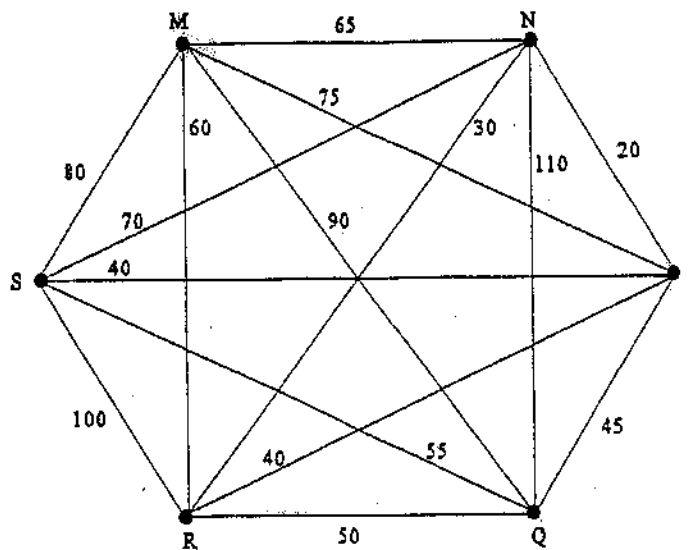


The following multiple choice questions are worth 5 points each.

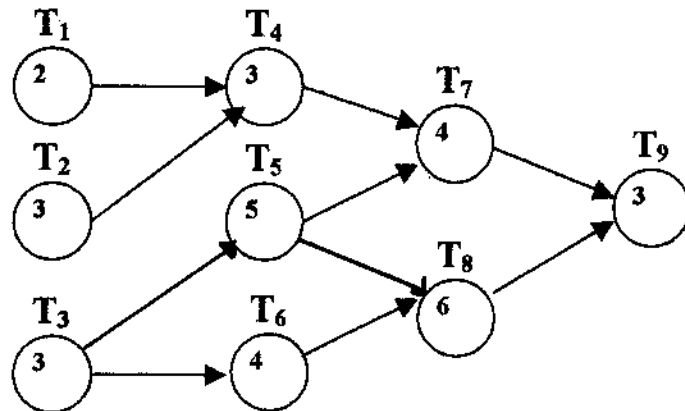
1. Which of the following statements is/are true?
 - I. Every graph with an Euler circuit has an even number of edges.
 - II. Every connected graph has an Euler circuit.
 - III. Every graph that has an Euler circuit is connected.
 - a. II and III
 - b. III only
 - c. All are true.
 - d. I and II
 - e. I only

2. For the graph below, what is the length of the Hamiltonian circuit obtained by using the nearest-neighbor algorithm starting at M?



- a. 310
 - b. 360
 - c. 295
 - d. 335
 - e. 290
3. Suppose an architect needs to design an intercom system for a large office building. The technique most likely to be useful in solving this problem is
 - a. finding an Euler circuit on a graph.
 - b. applying the nearest-neighbor algorithm for the traveling salesman problem.
 - c. applying Kruskal's algorithm for finding a minimum-cost spanning tree for a graph.
 - d. None of these techniques is likely to apply.

4. Use the critical-path scheduling algorithm to find a priority list for the tasks in this order-requirement digraph.



- | | | | |
|----|--|----|--|
| a. | T ₃ T ₅ T ₂ T ₆ T ₁ T ₄ T ₈ T ₇ T ₉ | c. | T ₃ T ₂ T ₁ T ₆ T ₅ T ₄ T ₈ T ₇ T ₉ |
| b. | T ₃ T ₅ T ₆ T ₈ T ₂ T ₁ T ₄ T ₇ T ₉ | d. | T ₁ T ₂ T ₃ T ₄ T ₅ T ₆ T ₇ T ₈ T ₉ |
| | | e. | T ₈ T ₅ T ₆ T ₇ T ₂ T ₃ T ₄ T ₉ T ₁ |

5. A talent show producer needs to fit 17 acts of varying lengths into several segments. The segments will be no more than 45 minutes long, and are to be separated by intermissions.

This problem could be solved by using

- | | |
|----|---|
| a. | the list processing algorithm for independent tasks. |
| b. | the worst-fit algorithm for bin packing. |
| c. | the critical-path scheduling algorithm. |
| d. | None of these techniques would work to find a solution. |
6. A ten-year study of low-birth weight babies is performed to determine if birth weight affects IQ and performance in elementary school. Children are identified in hospitals at birth and their performance is tracked until they are ten years old. This type of study is a(n)
- | | | | |
|----|---------------------------------------|----|-------------------|
| a. | comparative experiment | c. | prospective study |
| b. | experiment with compounding variables | d. | biased survey |

7. The lengths of long-distance telephone calls (in minutes) made by you in one year are given in the table below. Find the mean and standard deviation of the lengths of your long-distance telephone calls.

<u>Length of call</u>	<u>Number of calls</u>
1-5	12
6-10	26
11-15	20
16-20	7
21-25	11
26-30	7
31-35	4

- a. $\bar{x} = 13.92, s = 8.51$
- b. $\bar{x} = 18.00, s = 10.80$
- c. $\bar{x} = 12.43, s = 7.89$
- d. $\bar{x} = 13.92, s = 8.46$
- e. $\bar{x} = 12.43, s = 7.31$
8. A typing service keeps data on the number of pages in a manuscript and the length of time (in hours) it takes to complete the typing. The least squares regression line for the data is given by $y = 20 + 0.273x$. Use this to predict the length of time needed to type a 40-page manuscript.
- a. 810.92 hr
- b. 60.273 hr
- c. 30.92 hr
- d. 16.38 hr
9. Three dice are tossed. The sum of the numbers rolled is recorded. How many outcomes are in the sample space?
- a. 18
- b. 12
- c. 16
- d. 72
- e. none of the above
10. A fair coin is tossed three times. Find the probability of getting exactly 2 heads.

a. $\frac{1}{2}$

b. $\frac{1}{3}$

c. $\frac{2}{3}$

d. $\frac{3}{8}$

e. $\frac{1}{4}$

16. A summer sports league enrolls children aged 10, 11, and 12 to play baseball and soccer.

	Baseball	Soccer
10-year-olds	137	173
11-year-olds	162	158
12-year-olds	121	179

What percent of 11-year-olds play soccer?

- a. 55.8%
- b. 40.3%
- c. 54.8%
- d. 45.2%
- e. 49.4%

17. Which of the following statements is(are) true?

- I. Majority rule is a good way to choose between two alternatives.
- II. Every set of voters' preference lists produces a Condorcet winner.
- III. For a given set of voters' preference lists, different agendas for sequential pairwise voting may produce different winners.

- a. I and II
- b. I and III
- c. II and III
- d. All are true.
- e. None are true.

18. Twenty-four faculty members of The Juilliard School use approval voting to determine admission for ten applicants to the school as indicated in the following table. An X indicates an approval vote.

Applicants	Number of Voters				
	5	3	6	2	8
A	X		X	X	X
B	X	X		X	X
C			X		X
D		X	X	X	
E	X		X		X
F	X				X
G	X	X	X	X	
H		X		X	
I	X		X	X	
J		X	X	X	X

Which applicant(s) is (are) admitted if 75% approval is necessary?

- a. A only
- b. A, B, G, and J
- c. H only
- d. A, B, E, and J.
- e. No applicants are admitted.

Name: _____

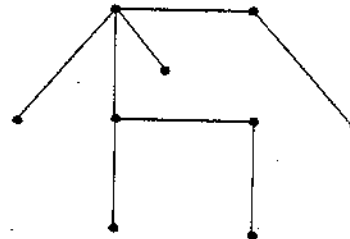
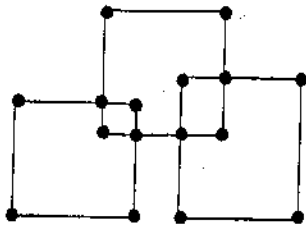
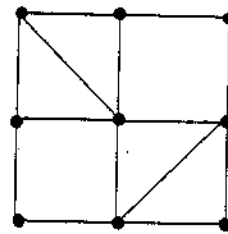
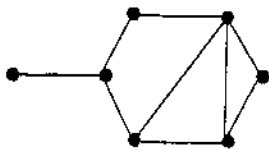
Section: _____

The following questions are free response. Please show all work in order to receive credit.

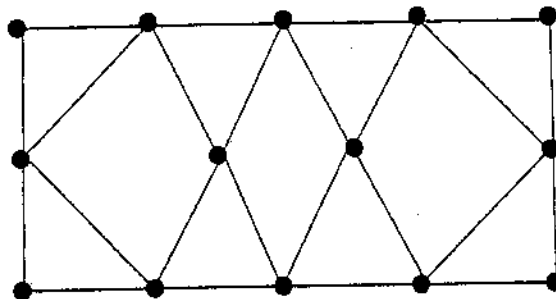
19. Match the following terms with their definitions (10 points).

- | | | |
|-----------------------------------|-------|--|
| Connected graph | _____ | A. The effect of a dummy treatment on the response of subjects. |
| Critical path | _____ | B. A graph in which it is possible to reach any vertex from any other vertex. |
| Euler circuit | _____ | C. A circuit that traverses each edge of a graph exactly once. |
| Path | _____ | D. A sample chosen by chance. |
| Spanning tree | _____ | E. The longest path in an order-requirement digraph. |
| Convenience sample | _____ | F. An experiment to compare two or more treatments in which subjects are assigned to treatments by chance. |
| Simple random sample | _____ | G. The effects of two variables on the outcome of a study cannot be distinguished from one another. |
| Randomized comparative experiment | _____ | H. A connected sequence of edges. |
| Placebo effect | _____ | I. A subgraph of a connected graph that is a tree and includes all the vertices of the original graph. |
| Confounding | _____ | J. A sample that consists of individuals who are most easily available. |

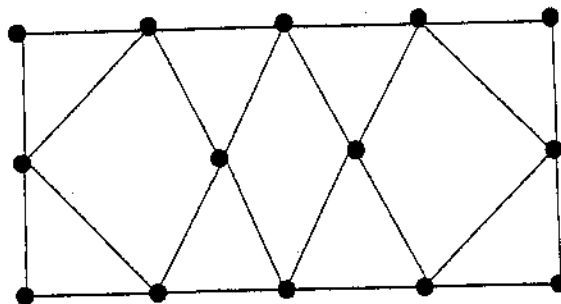
20. Find a spanning tree for each of the following graphs (8 points).



21. a. Does the graph shown below have an Euler circuit? If yes, show it by following the edges in numerical order or use arrows to indicate the direction of the circuit (6 points).



b. Does the graph shown below have a Hamilton circuit? If yes, show it by following the edges in numerical order or use arrows to indicate the direction of the circuit. (6 points).



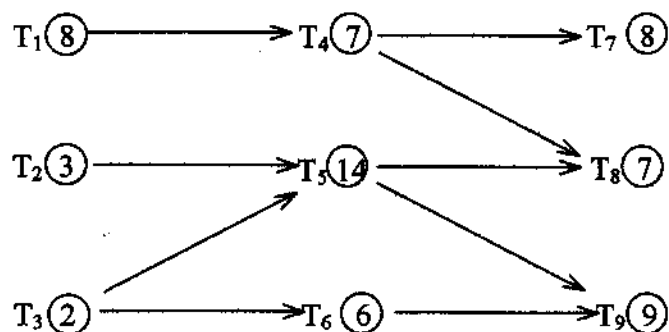
22. The following data shows ages at which teenagers and adults enrolled in an aerobics class (10 pts):

15	27	22	38	16	46
34	17	43	29	16	29
43	48	39	32	44	18
27	18	42	34	34	16
47	42	34	22	32	29

a. Construct a frequency distribution for this data using 6 classes.

b. Construct a frequency histogram for this data using 6 classes.

23. Given the order-requirement digraph below (with time given in minutes) and the priority list $T_2, T_3, T_1, T_5, T_4, T_6, T_9, T_7, T_8$, apply the list-processing algorithm to construct a schedule using three processors (9 pts).



24. (11 pts) Voters are to elect one of five candidates: A, B, C, D, or E. Their preference lists are shown below:

Number of Voters	5	3	8	7	4
First choice	C	D	E	B	A
Second choice	B	A	B	A	D
Third choice	D	C	A	C	C
Fourth choice	E	B	C	D	E
Fifth choice	A	E	D	E	B

Which candidate wins using:

a. plurality?

b. the Borda count?

c. sequential pairwise voting with agenda ABCDE?

d. the Hare system?