This exam contains 5 pages and 6 questions. Total of points is 100. For full credit you must show your work. Partial credit may be given for incorrect solutions if sufficient work is shown. New rule: messy/unorganized answers may be penalized, even if correct.
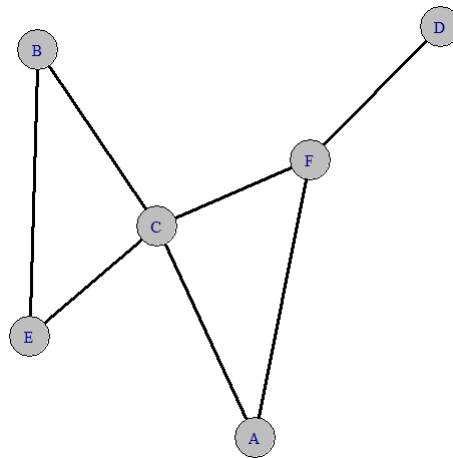
Grade Table (for teacher use only)

Question	Points	Score
1	20	
2	20	
3	10	
4	15	
5	15	
6	20	
Total:	100	

<u>**HONORS PLEDGE**</u> (sign after exam is completed): I have neither given nor received aid on this exam, nor have I observed a violation of the UVM Code of Academic Integrity.

Signature: _____

1. (20 points) Consider the graph

(a) (5 points) Represent the graph as an edgelist.

(b) (5 points) List the degree of each vertex.

(c) (5 points) Is there an Euler Circuit or Euler Path? If so, find one.

(d) (5 points) For each pair of vertices, list the length of the shortest path between them. Determine the diameter of the graph.

2. (20 points) Consider the graph with vertices A, B, C, D, E represented by the adjacency matrix

$$\begin{bmatrix} 0 & 1 & 1 & 1 & 0 \\ 1 & 0 & 1 & 1 & 1 \\ 1 & 1 & 0 & 1 & 0 \\ 1 & 1 & 1 & 0 & 1 \\ 0 & 1 & 0 & 1 & 0 \end{bmatrix}$$
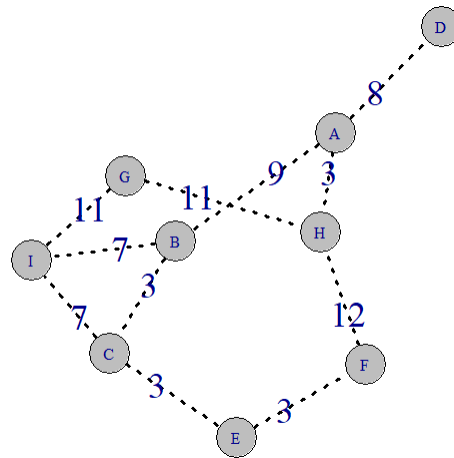
(a) (5 points) Draw the graph.

(b) (5 points) Find the largest clique.

(c) (5 points) List the degree of each vertex. Is there an Euler Circuit or Euler Path?

(d) (5 points) Calculate the redundancy and find a spanning tree.

3. (10 points) Consider the weighted graph

Use Kruskal's Algorithm to find the Minimum Spanning Tree. You can show your work by highlighting the dotted edges.

4. (15 points) Shown below is the preference schedule for an election with four candidates A, B, C, and D.

Number of voters	8	4	4	3
1st	C	A	A	D
2nd	D	B	D	A
3rd	B	D	B	B
4th	A	C	C	C

Determine the full ranking using the **Borda Count** method.

5. (15 points) Suppose we want to divide three items among two beings. From the bids shown below, use the Method of Sealed bids to determine the final settlement.

	Scooby Snack	Hot Dog	Sandwich
Shaggy	$10	$30	$60
Scooby	$40	$20	$20

6. (20 points) Suppose \$5000 is invested for 3 years with an APR of 2.8%.

   (a) (10 points) For each of the following compounding plans determine the final value.
       Show the calculations you perform.

Compounding plan	Final Value
annually	
quarterly (4× per year)	
daily	

   (b) (10 points) With simple interest, what APR would be needed to end with the same
       final value as in daily compounding?

Formulas:

$$R = M - (N - 1)$$

$$I = Prt$$
$$F = P(1 + rt)$$
$$F = P(1 + r)^t$$
$$F = P(1 + p)^T$$

$$L = \frac{p}{100} \cdot N, \quad \text{where } p \text{ is the desired percentile}$$

$$\text{percentile} = d_{L^+}, \quad \text{where } L^+ = L \text{ rounded up} \qquad (\text{if } L \text{ fractional})$$

$$= \frac{d_L + d_{L+1}}{2} \qquad\qquad (\text{if } L \text{ whole})$$

$$\text{Mean} = \frac{d_1 + \cdots + d_N}{N}$$

$$(\text{SD})^2 = \frac{(d_1 - \text{Mean})^2 + \cdots + (d_N - \text{Mean})^2}{N}$$

$$IQR = Q_3 - Q_1$$