Math 1116, Final Exam, Fall 2014   Name _____ KEY _____

Instructions: Show all work. Answer each question as completely as possible. Use exact values. For counting problems you may use scientific notation (with three significant figures) for any numbers larger than a million. You may round decimals to three significant figures as well.

1. Use Brute Force to find the minimal Hamilton circuit for the graph below. Clearly state the weight of the final graph you obtain. (30 points)
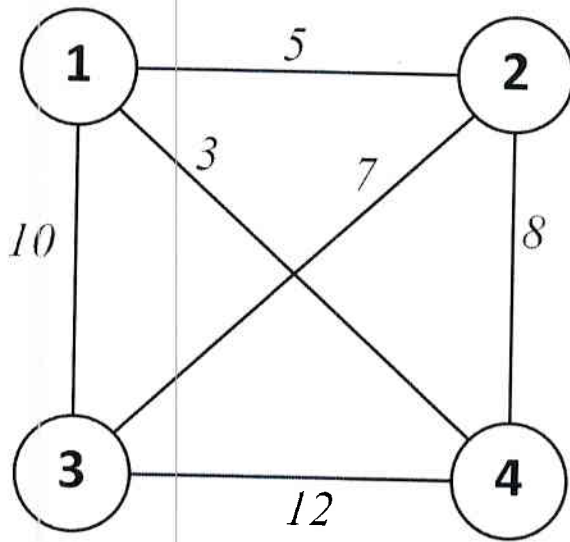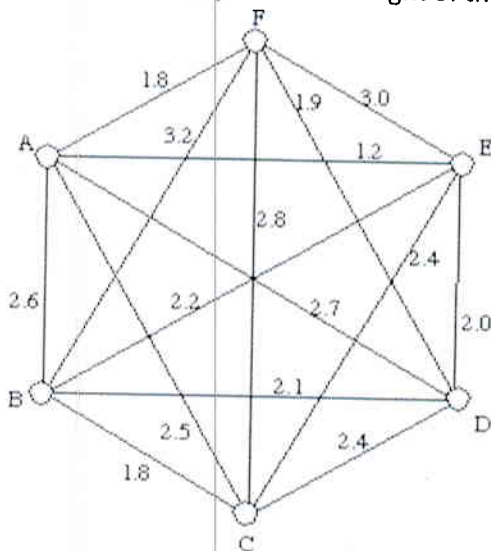

$12341 = 5+7+12+3 = 27$ ⟲

$12431 = 5+8+12+10 = 35$

$13241 = 10+7+8+3 = 28$

27 is the
optimal weight

2. Use the graph below to approximate the minimal Hamilton circuit using Repeated Nearest Neighbor. Clearly state the weight of the final graph you obtain. (30 points)

A E D F C B A
$1.2 + 2.0 + 1.9 + 2.8 + 1.8 + 2.6 = 12.3$

B C D F A E B
$1.8 + 2.4 + 1.9 + 1.8 + 1.2 + 2.2 = 11.3$

C B D F A E C
$1.8 + 2.1 + 1.9 + 1.8 + 1.2 + 2.4 = 11.2$ ✱

D F A E B C D
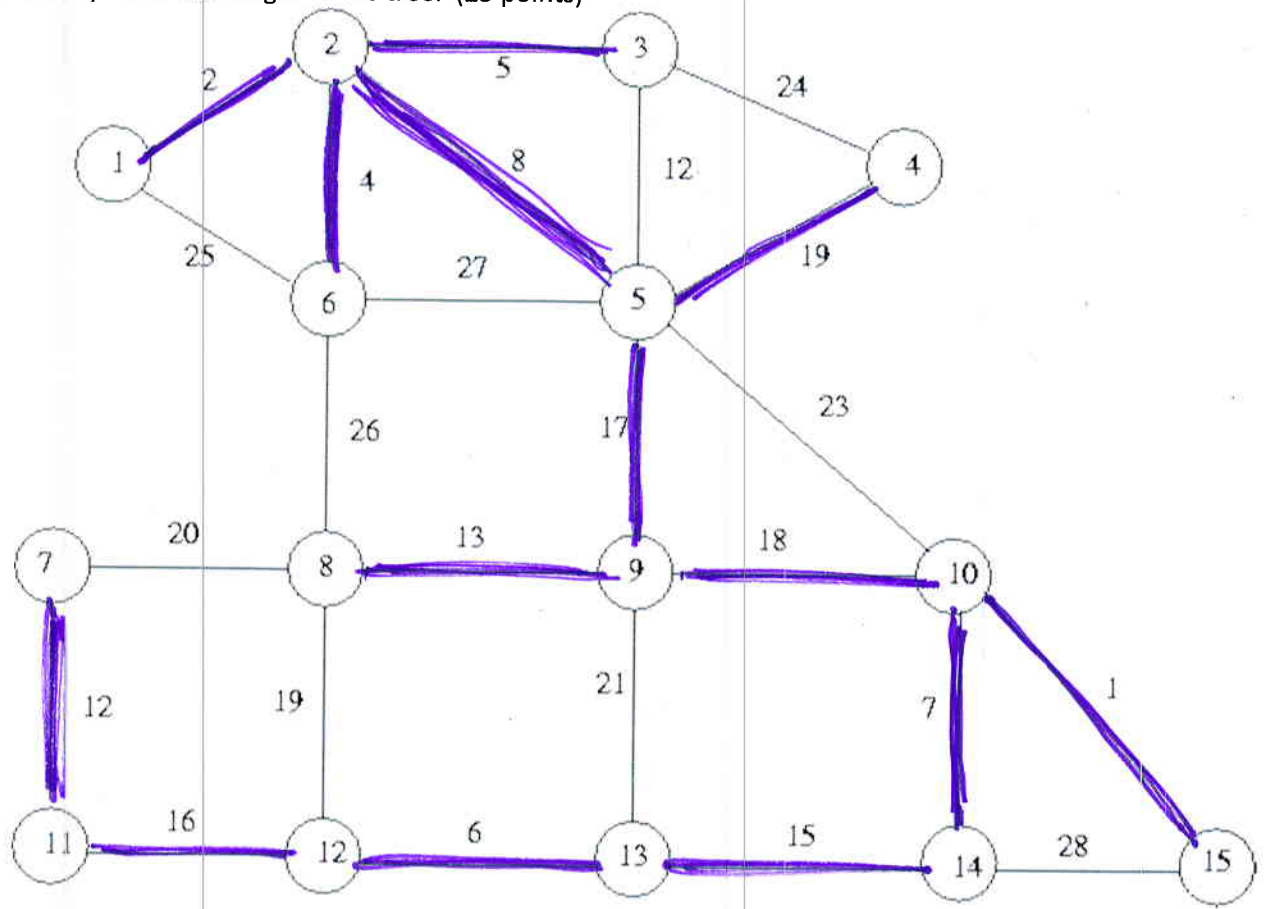$1.9 + 1.8 + 1.2 + 2.2 + 1.8 + 2.4 = 11.3$

E A F D B C E
$1.2 + 1.8 + 1.9 + 2.1 + 1.8 + 2.4 = 11.2$ ✱

F A E D B C F
$1.8 + 1.2 + 2.0 + 2.1 + 1.8 + 2.8 = 11.7$

lowest weight is 11.2

3. Find the minimal spanning tree for the graph below using Kruskal's (Sorted Edges) Algorithm. Clearly state the weight of the tree. (25 points)

$$1+2+4+5+6+7+8+12+13+15+16+17+18+19=$$

$$143$$

4. Use the Cheapest Link Algorithm on the chart below to approximate the minimal Hamilton circuit. State the weight of the final circuit. (25 points)

	Angela	Beatrice	Candace	Darlene	Eugenia	Fala	Ginger
Angela	--	97	22	6	57	52	29
Beatrice		--	72	66	98	59	68
Candace			--	39	69	41	12
Darlene				--	20	4	44
Eugenia					--	52	2
Fala						--	65
Ginger							--
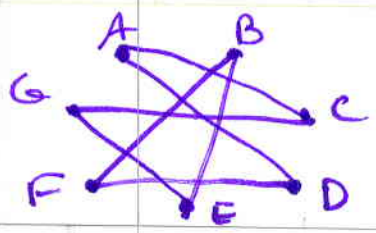
$$2+4+6+12+22+$$
$$59+98=203$$

5. List the sample spaces for the event: all the possible ways one can have three kids. (10 points)

BBB   BGG
BBG   GBG
BGB   GGB
GBB   GGG

6. What is the difference between a Hamilton circuit and an Euler circuit? (8 points)

Hamilton circuits visit all vertices once without repeating and then return to the start. Euler circuits visit all edges (& can repeat vertices) before returning to start.

7. What is the probability of flipping a coin and getting heads, and also rolling a die and obtaining an odd number? (8 points)

$$\frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}$$

8. If the probability of having a MasterCard is 60%, and the probability of having a Visa card is 75%. The probability of having both is 40%. What is the probability of having either a MasterCard or a Visa card? (10 points)

$$.60 + .75 - .40 = .95$$

9. What does it mean for two probabilities to be independent? (8 points)

know that event A occurred does not affect the probability of event B occurring.

10. Find the expected value of a raffle with 400 tickets sold for $5 apiece, and if there are 5 door prizes, each worth $100 dollars, and one top prize worth $500. Complete the table below. (10 points)

x		$500-5$	$100-5$	-5
$p(x)$		$1/400$	$5/400$	$394/400$

$$(495)\left(\tfrac{1}{400}\right)+(95)\left(\tfrac{5}{400}\right)-5\left(\tfrac{394}{400}\right) = -2.5$$

11. For each of the situations below, convert the odds to the indicated probability. (8 points each)

a. What is the probability of an event if the odds for the event are 10:7?

$$\frac{10}{17} \approx 58.8\%$$

b. What is the probability of an event if the odds against the event are 3:4?

$$\frac{4}{7} \approx 57\%$$

c. What is the complement of the event in part (b)?

$$1-\frac{4}{7}=\frac{3}{7} \approx 43\%$$

12. For each of the probabilities below, write the odds for or against the event as indicated. Be sure to reduce completely. (8 points each)

a. What are the odds for an event if the probability of the event is $\frac{3}{5}$?

$$5-3=2$$

$$3:2$$

b. What are the odds against an event if the probability of the event is $\frac{9}{16}$?
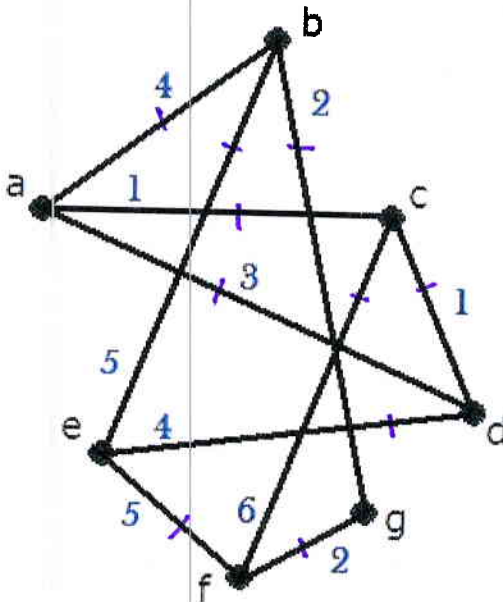
$16-9=7$

$7:9$

13. How many edges does a tree have if it has 12 vertices? (8 points)

11

$n-1$

14. What is the redundancy of the graph shown? (8 points)

7 vertices

tree needs 6 edges

10 edges on graph

redundancy is 4