Math 17 Final Exam Study Guide Solutions

* = multiple possible answers

1 a) $\{1\to2, 1\to5, 2\to3, 2\to5, 3\to4, 4\to5, 4\to6\}$

b) 1, 2, 3, 4 is a path of length 3
1, 2, 5, 4 also works

c) * 1, 2, 5 is a circuit. This is not a tree.

d)

vertex	deg
1	2
2	3
3	2
4	3
5	3
6	1

No EP/EC since more than 2 odd vertices

e)

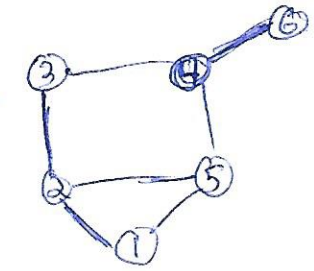
From	To	SP length
1	2	1
1	3	2
1	4	2
1	5	1
1	6	3
2	3	1
2	4	2
2	5	1
2	6	2

From	To	SP length
3	4	1
3	5	2
3	6	2
4	5	1
4	6	1
5	6	2

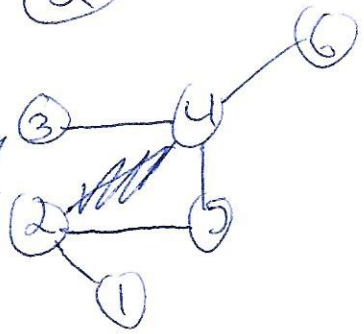
Diameter = 3

f) $R = 7-(6-1) = 7-5 = 2$

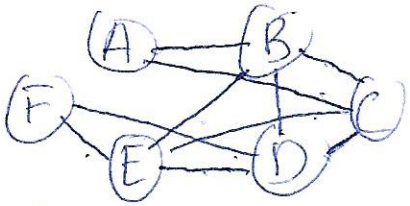
Graph



* Spanning tree



2 a)



* your layout may look different

b)

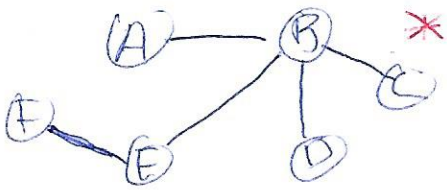
vertex	deg
A	2
B	4
C	4
D	4
E	4
F	2

All even vertices $\Rightarrow$ there is an EC (and therefore also EP)

* A, B, C, D, E, F, D, B, E, C, A is an Euler circuit

c) Shortest path from A to F is length 3.
You can check that is the "longest-shortest-path".
Diameter = 3

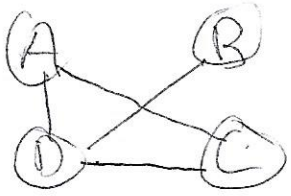
d) $R = 10 - (6-1) = 10 - 5 = (5)$



* Spanning Tree

e) Cliques of size 3: $\{A, B, C\}$ and $\{D, E, F\}$
Clique of size 4: $\{B, C, D, E\}$

3 || a)



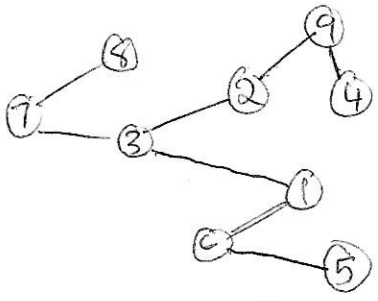
* your layout may look different

b) $\deg(A) = \deg(C) = 2$, $\deg(B) = 1$, $\deg(D) = 3$

c) Exactly 2 odd vertices $\Rightarrow$ Euler Path (No EC)
* B, D, A, C, D is an Euler Path

4 || a) $R = 15 - (9-1) = (7)$

b)



Minimum Spanning Tree

Add edges
5 → 6
4 → 9
1 → 6
1 → 3
2 → 3
2 → 9
7 → 8
3 → 7

Chapter 1

# voters	10	8	5	1
1st	C	A	B	B
2nd	B	B	A	A
3rd	A	D	D	C
4th	D	C	C	D

1. Borda count

$A = 10(2) + 8(4) + 5(3) + 1(3) = 70$

$B = 10(3) + 8(3) + 5(4) + 1(4) = 78$

$C = 10(4) + 8(1) + 5(1) + 1(2) = 55$

$D = 10(1) + 8(2) + 5(2) + 1(1) = 37$

Ranking B, A, C, D

2. Pairwise Comparisons

(A) vs (B) : 8 vs 16
(A) vs C : 14 vs 10
(A) vs D : 24 vs 0
(B) vs C : 14 vs 10
(B) vs D : 24 vs 0
C vs (D) 11 v 13

A = 2, B = 3, C = 0, D = 1 pts

Ranking B, A, D, C

Chapter 3

	EW	FB	IC	TT	Total	Fair Share
Harry	600	300	200	100	1200	400
Ron	200	450	150	100	900	300
Hermione	100	200	100	500	900	300

Harry gets 800 which is 400 more than FS
$\Rightarrow$ Harry owes 400.

Ron gets 450 which is 150 more than FS
$\Rightarrow$ Ron owes 150

Hermione gets 500 which is 200 more than FS
$\Rightarrow$ Hermione owes 200

Money pot (Surplus) $= 400 + 150 + 200 = 750 \Rightarrow$ Surplus Division $= \frac{750}{3} = 250$

Final Settlement

Harry: EW + 250 − 400 + IC $=$ EW + IC, owe 150

Ron: FB + 250 − 150 $=$ FB, get 100

Hermione: TT + 250 − 200 $=$ TT, get 50

Chapter 10

Compounding plan	F
annually	$3000(1+.03)^5 = 3477.82$
semi-annually	$3000(1+\frac{.03}{2})^{5\cdot 2} = 3481.62$
quarterly	$3000(1+\frac{.03}{4})^{5\cdot 4} = 3483.55$
monthly	$3000(1+\frac{.03}{12})^{5\cdot 12} = 3484.85$

Simple interest

$P = 3000$
$r = ??$
$t = 5$
$F = 3484.85$

$$3484.85 = 3000(1+r\cdot 5)$$

$$1.16 = \frac{3484.85}{3000} = 1+5r$$

$$r = \frac{1.16-1}{5} = .032$$

Chapter 15

Dataset: 1, 2, 4, 5, 5, 5, 6, 6, 7, 9

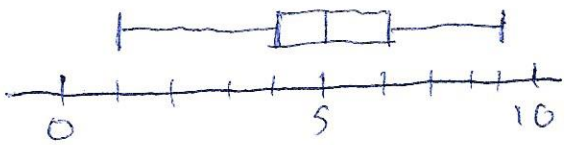
1. Min = 1, Max = 9

Q_1: $L = \frac{25}{100}\cdot 10 = 2.5 \rightarrow Q_1 = d_3 = 4$

Q_3: $L = \frac{75}{100}\cdot 10 = 7.5 \rightarrow Q_3 = d_8 = 6$

Med: $L = \frac{50}{100}\cdot 10 = 5 \rightarrow Med = \frac{d_5+d_6}{2} = \frac{5+5}{2} = 5$

2.



3. $Mean = (1+2+4+3(5)+2(6)+7+9)/10 = \boxed{4.6}$

$Sd^2 = [(1-4.6)^2+(2-4.6)^2+\ldots+(9-4.6)^2]/10$

$= \frac{49.6}{10} = 4.96$

$sd = \sqrt{4.96} = \boxed{2.23}$

4. $\mu - .675\sigma = 4.6 - .675\cdot 2.23 = 3.09$ ⟷ Actual (Part 1): 4

$\mu + .675\sigma = 4.6 + .675\cdot 2.23 = 6.11$ ⟷ 6

Actual quartiles are pretty close to what they would be if we assumed data to be normally distributed.
⇒ Conclude Data is approximately normal