CAS CS 350 HW5

Andrea Lopez

TOTAL POINTS

92 / 100

QUESTION 1

1 Q1 **29 / 30**

- **0 pts** Correct

a)

✓ - **0 pts** **Correct**

- **1 pts** Minor mistakes in job length
- **1 pts** Minor mistakes in arrival time
- **2 pts** Incorrect task/job notations
- **4 pts** Major errors in job length
- **4 pts** Major errors in arrival time
- **7 pts** Incorrect/no answer given

b)

✓ - **0 pts** **Correct**

- **3 pts** Incorrect observation about preemptiveness
- **3 pts** Incorrect observation about scheduling priority
- **3 pts** Incorrect scheduling policy
- **2 pts** Correct scheduling policy but no reasoning is given
- **5 pts** Incorrect/no answer given

c)

✓ - **0 pts** **Correct**

- **2 pts** Minor mistakes
- **3 pts** Incorrect reasoning
- **5 pts** Incorrect/no answer given

d)

- **1 pts** Minor mistakes
- **3 pts** Some mistakes
- **5 pts** Major mistakes
- **8 pts** No work shown

e)

✓ - **1 pts** **Minor mistakes in reasoning**

- **3 pts** No/incorrect reasoning
- **5 pts** No work shown

QUESTION 2

2 Q2 **33 / 40**

- **0 pts** Correct

a)

✓ - **0 pts** **Correct**

- **2 pts** Minor errors in diagram/unclear labels
- **3 pts** Missing all arrival time arrows
- **4 pts** Major errors in diagram
- **5 pts** Incorrect/no answer given

b)

- **0 pts** Correct

✓ - **3 pts** **Minor errors in diagram**

- **4 pts** missing all arrival arrows
- **5 pts** Major errors in diagram
- **5 pts** Missing calculation for predictions
- **6 pts** Missing diagram
- **10 pts** Incorrect/no answer given

c)

✓ - **0 pts** **Correct**

- **3 pts** Minor calculator errors
- **5 pts** major calculation errors/incorrect conclusion but reasonings are shown
- **4 pts** Correct answer without reasoning
- **10 pts** Incorrect/no answer given

d)

✓ - **0 pts** **Correct**

- **2 pts** Minor calculation errors
- **3 pts** missing the conclusion about "how scheduler was impacted by the its inability to predict the future"
- **4 pts** missing calculation for individual slowdowns
- **4 pts** Incorrect website
- **3 pts** Correct answer without reasoning

- **7 pts** Incorrect/no answer given

e)

- **0 pts** Correct
- **3 pts** Minor calculation errors

✓ - **4 pts** **Missing analysis for average prediction error/missing analysis for certain $$\alpha$$ values**

- **4 pts** Correct answer but missing reasoning
- **8 pts** Incorrect/no answer given

QUESTION 3

3 Q3 30 / 30

✓ - **0 pts** **Correct**

a)

- **1 pts** Minor error
- **3 pts** Some mistakes in the drawing
- **5 pts** Major mistakes in the drawing
- **8 pts** No work shown

b)

- **1 pts** Minor error
- **3 pts** Some mistakes in the drawing
- **5 pts** major mistakes in the drawing
- **8 pts** No work shown

c)

- **1 pts** minor error
- **4 pts** incorrect logic/reasoning
- **7 pts** No work shown

d)

- **1 pts** Minor error
- **3 pts** incorrect calculation
- **6 pts** No calculation
- **7 pts** No work shown

Problem 1

a)

job	arrival time	job length
$j_{1,1}$	0	3
$j_{1,2}$	10	1
j_2	1	5
$j_{3,1}$	3	2
$j_{3,2}$	11	4
j_4	5	6
j_5	7	2

b) Shortest Remaining Time (SRT)

Why?

- First, $j_{1,1}$ arrives and gets executed immediately (because there is no other job there) and it ends at time 3. At that points, two more jobs had arrived (j_2 and j_3) and the scheduling system executed the shorter job of the two (j_3). Therefore, j_2 doesn't get executed until time 5, because the arriving jobs that had shorter lengths got executed first. This shows that the schedule followed the rule of the shortest remaining time jobs next because this same rule can be seen for the remaining jobs.

c) Decision at time 11

① j_2 is executing (time remaining = 2), j_3 arrives, and j_4 is still waiting for execution

② evaluate remaining lengths of jobs

↳ j_2 (2) ← shortest

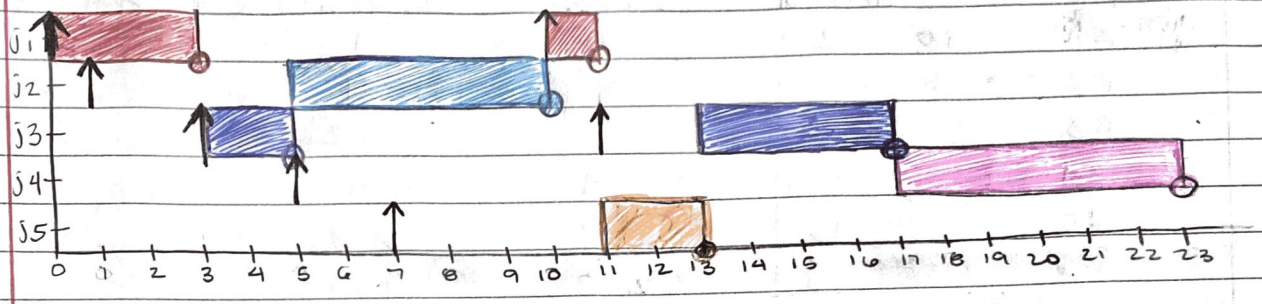
↳ j_3 (4)

↳ j_4 (6)

③ choose to execute j_2 since it is the SRT

Problem 1 continued--

d) SJN scheduling



e) NO T exists that would cause starvation for j5. Which can be seen when the diagram is continued.

1 Q1 29 / 30

- **0 pts** Correct

a)

✓ - **0 pts** **Correct**

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- **1 pts** Minor mistakes in arrival time
- **2 pts** Incorrect task/job notations
- **4 pts** Major errors in job length
- **4 pts** Major errors in arrival time
- **7 pts** Incorrect/no answer given

b)

✓ - **0 pts** **Correct**

- **3 pts** Incorrect observation about preemptiveness
- **3 pts** Incorrect observation about scheduling priority
- **3 pts** Incorrect scheduling policy
- **2 pts** Correct scheduling policy but no reasoning is given
- **5 pts** Incorrect/no answer given

c)

✓ - **0 pts** **Correct**

- **2 pts** Minor mistakes
- **3 pts** Incorrect reasoning
- **5 pts** Incorrect/no answer given

d)

- **1 pts** Minor mistakes
- **3 pts** Some mistakes
- **5 pts** Major mistakes
- **8 pts** No work shown

e)

✓ - **1 pts** **Minor mistakes in reasoning**

- **3 pts** No/incorrect reasoning
- **5 pts** No work shown

Problem 2

c) Forseeable Server ← faster

Website 1: 6
Website 2: 7
Website 3: 5
} 6

Predicted Tq

Website 1: 4.8
Website 2: 9.5
Website 3: 4.6
} $\frac{18.96}{3} = 6.32$

Yes, because the average response time for the predicted schedule is 6.32 and the average response time for the forseeable schedule is 6.0, which is lower. Therefore, this means the forseeable schedule had a faster performance (by 0.32) than the predictive schedule, meaning that not knowing the future did cause a performance degradation (in terms of Tq).

d) Website with shorter-lived requests: Website 3

↳ Nonpredicted slowdown:

$\frac{Tq}{TS} = \frac{6}{2.16} = 2.307$ ← greater slowdown

↳ Predicted slowdown:

$\frac{Tq}{TS} = \frac{6.32}{2.16} = 2.154$

This shows that the scheduler's inability to predict the future negatively impacted the slowdown for website 3. This is because the slowdown for the nonpredictive scheduler (2.307) increased from that of the predictive scheduler (2.154), signifying that website 3 was slower when not being able to predict the future.

e) 0.3 - farther away from actual value
0.5 - what was found
0.8 - closer to the actual values
} derived from what was explained in lecture

↑ α = more closel related to ag

↓ α = more loosely related to ag

↳ Yes, we can use 0.8 to give a closer match with what was drawn in Part A. This is because a higher alpha means that most of the distribution's weight is given to the initial observation & then exponentially decays. Furthermore, it gives higher priority/importance to the lengths of the most recent past requests.

2a)

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
website 1	0			3						9	11																	27				31	31	33								39	41							
webiste 2						5			9						14					19		21		24		25	27							33		36									43			47	
website 3				3	5							11		14						19	21				24	25												36		39			41	43						

(not predicted)

	Website 1					Website 2					Website 3						
	arrival	length	finish	tq	start	arrival	length	finish	start	tq	arrival	length	finish	start		tq	ts
1	0	3	3	3		1	4	9		8	2	2	5	3		3	2
2	9	2	11	2		9	5	19	14	10	9	3	14	11		5	3
3	15	4	31	16		18	3	24		6	16	2	21	19		5	2
4	28	2	33	5		25	2	27		2	23	1	25	24		2	1
5	37	2	41	4		30	3	36		6	30	3	39	36		9	3
6			W1 tq	6		37	4	47		10	37	2	43	41		6	2
								W2 tq		7					W3 tq	5	slowdown 2.3076
															ts	2.1666	total Tq 6

2b)

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
website 1	0			3						9	11											21			25					29	31											41	43					
website 2					3			7							14					19						25-26	26			29						34	36	36		39				43			47	
webiste 3									7	9		11		14						19	21										31		34						39	41								

(predicted)

	Website 1				Website 2				Website 3						
	arrival	length	finish	tq	arrival	length	finish	tq	arrival	length	finish	start		tq	ts
1	0	3	3	3	1	4	7	6	2	2	9	7		7	2
2	9	2.5	11	2	9	4.5	19	10	9	2.5	14	11		5	3
3	15	3.25	25	10	18	3.75	29	11	16	2.25	21	19		5	2
4	28	2.625	31	3	25	2.875	36	11	23	1.625	26	25		3	1
5	37	2.3125	43	6	30	2.9375	39	9	30	2.3125	34	31		4	3
6			W1 tq	4.8	37	3.46875	47	10	37	2.15625	41	39		4	2
							W2 tq	9.5					W3 tq	4.6666	slowdown 2.1538
													ts	2.1666	Total p Tq 6.3222

2 Q2 33 / 40

- **0 pts** Correct

a)

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b)

- **0 pts** Correct

✓ **- 3 pts Minor errors in diagram**

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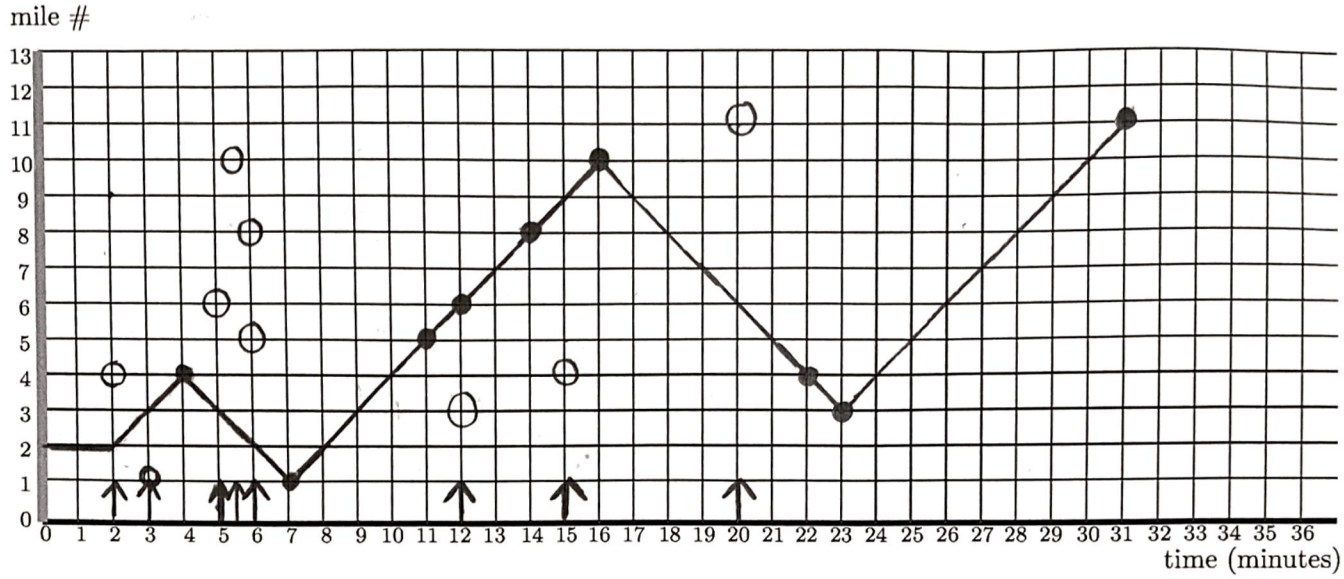
e)

- **0 pts** Correct
- **3 pts** Minor calculation errors

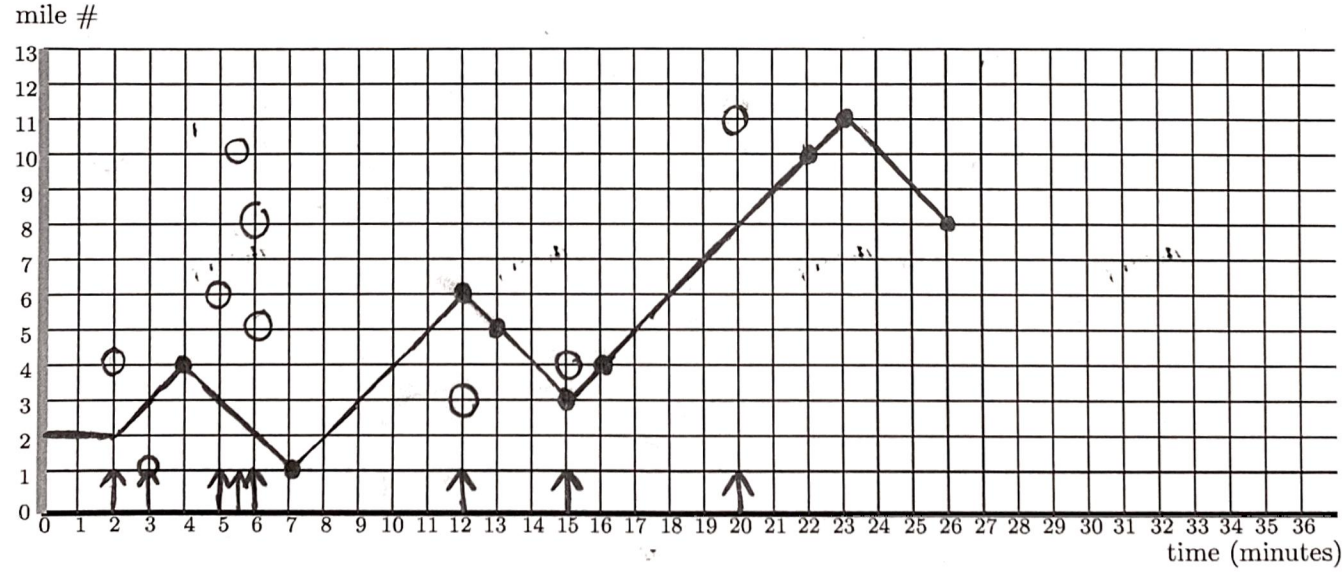
✓ **- 4 pts Missing analysis for average prediction error/missing analysis for certain $$\alpha$$ values**

- **4 pts** Correct answer but missing reasoning
- **8 pts** Incorrect/no answer given

a) Use the grid below to represent the position of the drone if its movements in response to the incoming requests are scheduled according to Shortest Scan Next.



b) Use the grid below to represent the position of the drone if its movements in response to the incoming requests are scheduled according to First Ready, First Come First Served. Requests can be considered *ready* if they are within a ±3 miles range from the current location of the drone. If two or more requests are *ready*, the closest one is selected.



Problem 3 continued on next page...

notes:
- drone maxes 4 mi/min

Problem 3

c)

request	arrival	service	finish	current drone
R1	2	2	4	
R2	3	3	7	
R3	5	5	12	
R4	5.5	4	16	
R5	6	2	18	
R6	6	3	21	
R7	12	2	23	
R8	15	1	24	
R9	20	7	31	

↳ R9 gets done at 31 min
- response time = finish time - arrival
$t_9 = 31 - 20$
$t_9 = 11$ minutes

d) ① get avg response time for SSN

$$\frac{2+4+5+7+8+10.5+7+11+11}{9} = 7.277$$

② get avg response time for FR-FCFS

$$\frac{2+4+7+7+3+1+16.5+20+3}{9} = 7.055$$

↳ yields shorter avg response time
↳ yields shorter active flight time

- FR-FCS is the better strategy to minimize the latency perceived by the users and the active flight time.

3 Q3 30 / 30

✓ **- 0 pts** **Correct**

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