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Section: CSE-1

Course : CSE 4549

Course Name: Simulation and Modelling

Exam : Semester Final

Academic Year : 2020-2021

Semester: Fifth

Date : 08-Sep-21

Ans. to Q no. 2

There are $n=30$, data in the table.

The number of intervals, $k = 1+\log_2 n$

$= 1+\log_2 30$

$\simeq 6$

The lowest data is 6 and highest is 99.7.

The range is $99.7-6=93.7$

We take 7 intervals with an interval size of

$\left(93.7/6\right) \simeq 15$

The frequency table is given:

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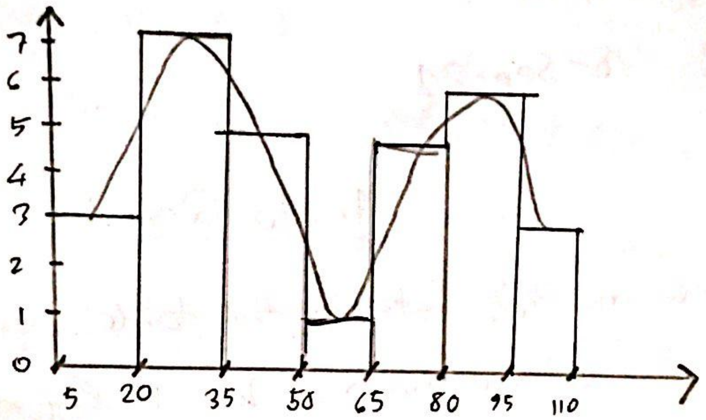
Interval	Tally	Frequency
[5, 20)	III	3
[20, 35)	~~IIII~~ II	7
[35, 50)	~~IIII~~	5
[50, 65)	I	1
[65, 80)	~~IIII~~	5
[80, 95)	~~IIII~~ I	~~5~~6
[95, 110)	III	3



This is ~~an~~ ~~ab~~ probably a beta or gamma distribution but I didn't study that distribution, so I'm not sure.

(b) We find the max ~~variat~~ difference of distribution with data

$d^+ =$

$d^- =$

$d = \max(d^+, d^-)$

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Ans. to Q no. 3

Confidence level = 90% = 0.9

$\therefore \alpha = 1 - 0.9 = 0.1$

For policy (50,30),

confidence interval, $\bar{Y}_i \pm t_{3, 1-\alpha/2} \times \sqrt{\frac{S_i^2}{n}}$

$= 231.73 \pm 2.353 \times \sqrt{\frac{7.19^2}{4}}$

$= 231.73 \pm 8.459$ (Ans.)

For policy (50, 40),

confidence interval, $\bar{Y}_i \pm t_{3, 0.95} \sqrt{\frac{S_i^2}{n}}$

$= 230.83 \pm 2.353 \times \sqrt{\frac{9.86^2}{4}}$

$= 230.83 \pm 11.6$ (Ans.)

For policy (100,30),

confidence intervals, $\bar{Y}_i \pm t_{3, 0.95} \sqrt{\frac{S_i^2}{n}}$

$= 261.85 \pm 2.353 \times \sqrt{\frac{8.19^2}{4}}$

$= 261.85 \pm 9.635$ (Ans.)

For policy (100,40),

confidence intervals, $\bar{Y}_i \pm t_{3, 0.95} \sqrt{\frac{S_i^2}{n}}$

$= 262.12 \pm 2.353 \times \sqrt{\frac{5.89^2}{4}}$

$= 262.12 \pm 6.929$ (Ans.)

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Ans. to Q no. 4

For each replication, we calculate the effect

Design Points	q	p	q x p
1	−	−	+
2	+	−	−
3	−	+	−
4	+	+	+

Replication	R_1	R_2	R_3	R_4	e_q	e_q	e_p	$e_{q \times p}$
1	14.79	4.32	11.61	4.37	−4.427 ~~17.71~~	−8.855	−1.565	1.615
2	14.12	4.47	8.31	4.99	−3.242	−6.485	−2.645	3.165
3	12.54	9.5	9.46	5.22	−1.82	−3.64	−3.68	−0.6
4	14.73	5.37	12.75	4.64	−4.367	−8.735	−1.355	0.625
5	10.56	5.1	9.04	4.82	−2.42	−4.84	−0.9	0.62
6	11.45	6.37	9.95	4.05	−2.745	−5.49	−1.91	−0.41
7	11.16	6.38	9.64	4.55	−2.467	−4.935	−1.675	−0.155
8	10.07	6.36	9.52	5.07	−2.04	−4.08	−0.92	−0.37
9	12.72	6.27	11.18	7.1	−2.632	−5.265	−0.355	1.185
10	12.04	7.59	8.00	4.8	−1.967	−3.935	−3.525	0.515

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$$e_{q8} = \frac{-R_1+R_2-R_3+R_4}{2}$$

$$e_p = \frac{-R_1-R_2+R_3+R_4}{2}$$

$$e_{qp} = \frac{R_1-R_2-R_3+R_4}{2}$$

For the main factors e_q,

the mean is $\overline{e_q} = \frac{\sum^{10} e_{q_i}}{10} = -5.626$

the standard deviation is

$$\cancel{s_x = \frac{\sum_{i=1} (x_i - \bar{x})^2}{n-1}}$$

$$s_{e_q} = \frac{\sum_{i=1}^{10} (e_{q_i} - \overline{e_q})^2}{n-1} = 1.864$$

$\alpha = 1 - 0.9 = 0.1$

Confidence interval is

$$\overline{e_q} \pm t_{9,0.95} \frac{s_{e_q}}{\sqrt{n}}$$

$$= -5.626 \pm 1.833 \times \frac{1.864}{\sqrt{10}}$$

$$= -5.626 \pm 1.08$$ (Ans)

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For main effect, e_p,

the mean is $\bar{e}_p = \frac{\sum_{i=1}^{10} e_{p_i}}{10} = -1.8528$

the S.D. is $S_{e_p} = \frac{\sum_{i=1}^{10} (e_{p_i} - \bar{e}_p)^2}{n-1} = 1.11332$

confidence interval is ~~t 0.9~~

$$\bar{e}_p \pm t_{9,0.95} \frac{S_{e_p}}{\sqrt{n}}$$

$$= -1.8528 \pm \cancel{18.33}\ 1.833 \times \frac{1.1133}{\sqrt{10}}$$

$$= -1.8528 \pm 0.645 \text{ (Ans.)}$$

And, for interaction effect,

mean is $\overline{e_{pq}} = \frac{\sum_{i=1}^{10} e_{pq_i}}{10} = 0.619$

S.D is $S_{e_{pq}} = \frac{\sum_{i=1}^{10} (e_{pq_i} - \overline{e_{pq}})^2}{n-1}$

$= 1.1511$

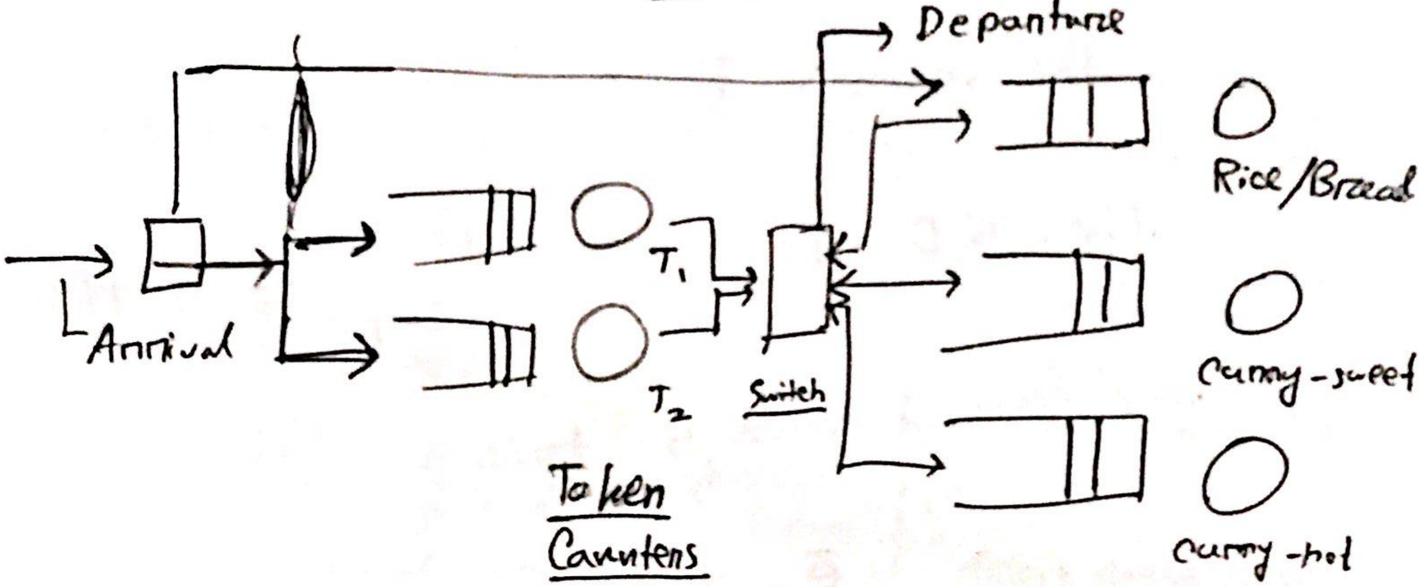
confidence interval is,

$$\overline{e_{pq}} \pm t_{9,0.95} \frac{S_{e_{pq}}}{\sqrt{n}}$$

$$= 0.619 \pm 1.833 \times \frac{1.511}{\sqrt{10}}$$

$$= 0.619 \pm 0.8758 \text{ (Ans.)}$$

Ans. to Q. no 1



a) State variables are

1) token counter-1 status t_{x_1}
2) token counter-2 status t_{x_2}
3) token counter-1 queue length t_{q_1}
4) token counter-2 queue length t_{q_2}

5) Rice counter status r_x
6) Rice counter length r_q
7) curry sweet status s_x
8) curry sweet length s_q
9) curry hot status h_x
10) curry hot length h_q
11) switch student no. s_w

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b) Set of events are

i) ~~Customer~~ Student Arrival

ii) ~~Token Server~~ Get token

iii) Student Switch (goes to switch from any ~~server~~) counter)

iv) Get Rice

v) Get ~~B~~ Curry Sweet

vi) Get Curry Hot

vii) Student Departure

viii) Termination

c) token counter status ~~ts~~ t_{x_i} $(i = 1, 2)$

$$t_{x_i}(t^+) \begin{cases} t_{x_i}(t) == 0 \,?\, 1 : t_{x_i}(t) & \text{get token } \cancel{\text{arrival}} \\ t_{q_{x_i}}(t) > 0 \,?\, t_{x_i}(t) : 0 & \text{student switch} \\ t_{x_i}(t) & \text{o/w} \end{cases}$$

$$t_{q_1}(t^+) \begin{cases} t_{q_1}(t) > 0 \,?\, t_{q_i}(t) + 1 : t_{q_i}(t) & \cancel{\text{arrival}} \text{ get token} \\ \max(0, t_{q_i}(t) - 1) & \text{student switch} \\ t_{q_i}(t) & \text{o/w} \end{cases}$$

for rice counters, r_x, r_q

$$r_x(t^+) = \begin{cases} r_x(t) == 0 \,?\, 1 : r_x(t) & \text{get rice} \\ r_q(t) > 0 \,?\, r_x(t) : 0 & \text{student switch} \\ r_x(t) & \text{o/w} \end{cases}$$

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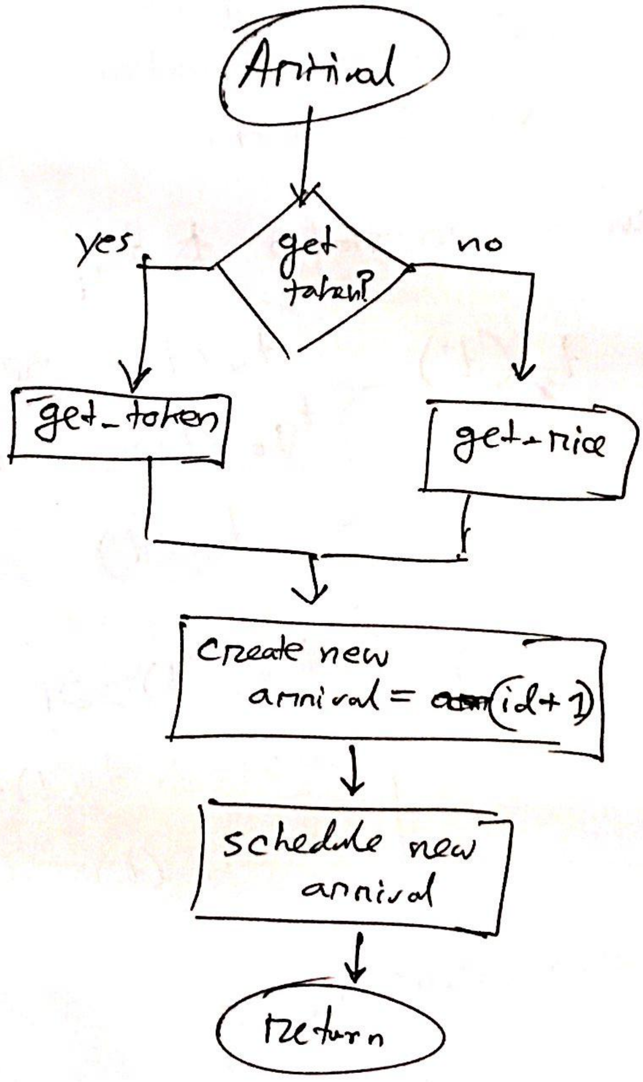
for rice queue,

$$r_q(t^+) \begin{cases} r_q(t) > 0 \,?\, r_q(t)+1 : r_q(t) & \text{get rice} \\ \max(0, r_q(t)-1) & \text{student switch} \\ r_q(t) & \text{o/w} \end{cases}$$

For curry hot and sweet, it will be same as rice.

(d)



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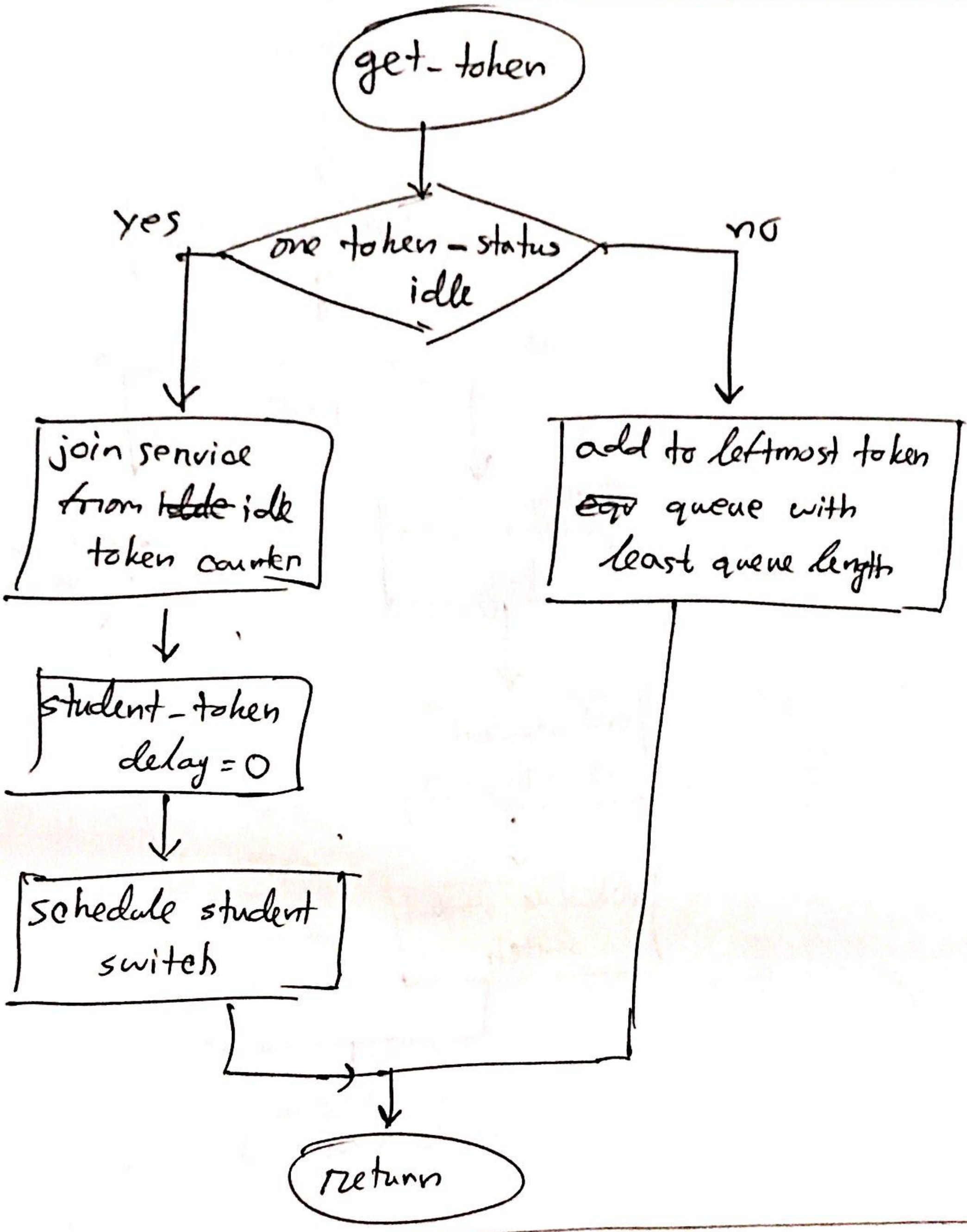

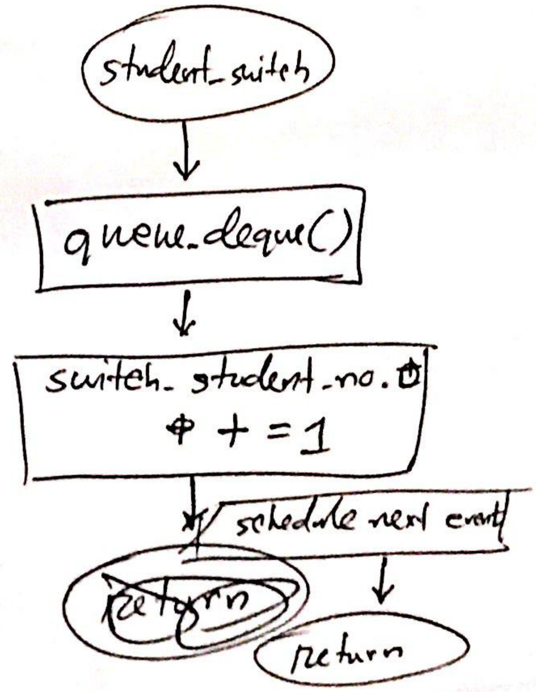

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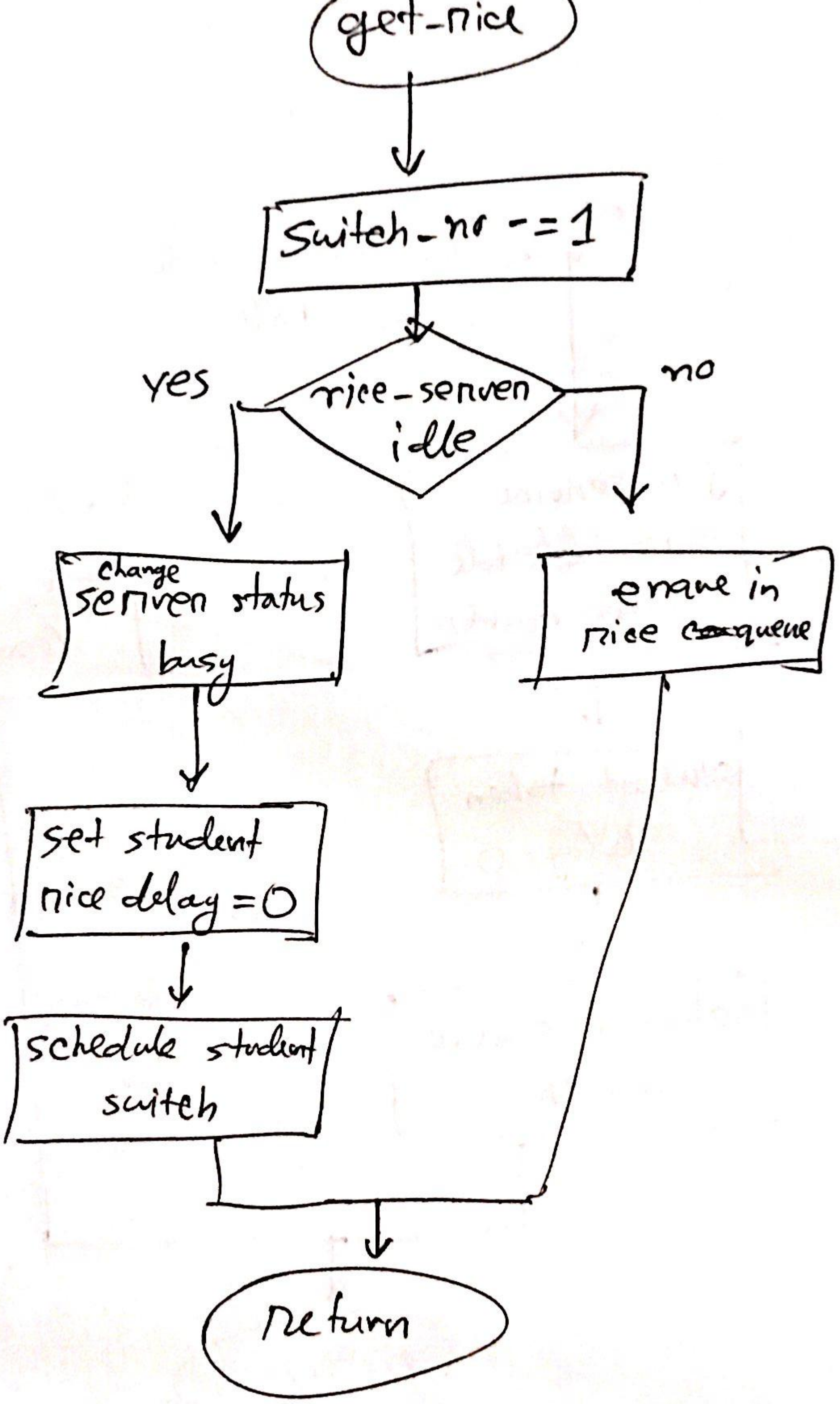

The get curry hot, and sweet will be same.

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