University of Asia Pacific

Department of CSE

Name: Rashik Rahman

Reg ID: 17201012

Year: 4th

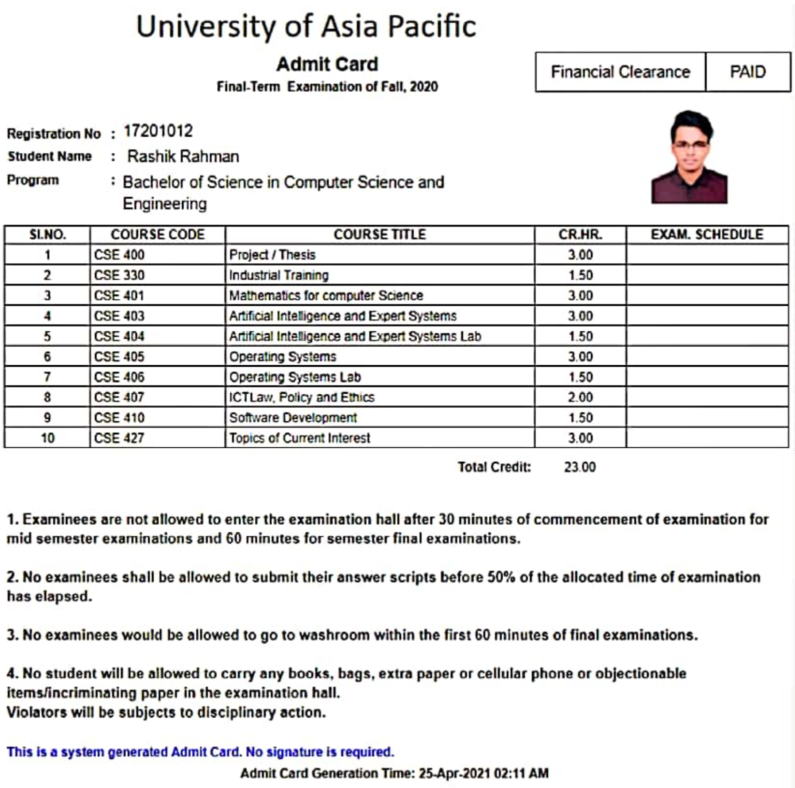
Semester: 1st

Course Code: CSE 401

Course Title: Mathematics for computer Science

Date: 06.05.2021

"During Examination and upload time I will not take any help from anyone. I will give my exam all by myself."



University of Asia Pacific

Admit Card

Final-Term Examination of Fall, 2020

Financial Clearance	PAID

Registration No : 17201012

Student Name : Rashik Rahman

Program : Bachelor of Science in Computer Science and Engineering

SI.NO.	COURSE CODE	COURSE TITLE	CR.HR.	EXAM. SCHEDULE
1	CSE 400	Project / Thesis	3.00	
2	CSE 330	Industrial Training	1.50	
3	CSE 401	Mathematics for computer Science	3.00	
4	CSE 403	Artificial Intelligence and Expert Systems	3.00	
5	CSE 404	Artificial Intelligence and Expert Systems Lab	1.50	
6	CSE 405	Operating Systems	3.00	
7	CSE 406	Operating Systems Lab	1.50	
8	CSE 407	ICTLaw, Policy and Ethics	2.00	
9	CSE 410	Software Development	1.50	
10	CSE 427	Topics of Current Interest	3.00	

Total Credit: 23.00

1. Examinees are not allowed to enter the examination hall after 30 minutes of commencement of examination for mid semester examinations and 60 minutes for semester final examinations.

2. No examinees shall be allowed to submit their answer scripts before 50% of the allocated time of examination has elapsed.

3. No examinees would be allowed to go to washroom within the first 60 minutes of final examinations.

4. No student will be allowed to carry any books, bags, extra paper or cellular phone or objectionable items/incriminating paper in the examination hall.
Violators will be subjects to disciplinary action.

This is a system generated Admit Card. No signature is required.

Admit Card Generation Time: 25-Apr-2021 02:11 AM

Answer to the Q. No. 1 (a)

i) As we are assuming ~~x~~ a random variable X is used to store the number of times I need to ~~ratt~~ roll the dice to get the first "6", so X is is a geometric random variable.

ii) If we consider probability of getting ~~first~~ "6" as p and others before the first "6" as ~~(p-1)~~ (1-p) then the probability ~~function~~ for getting the first "6" after rolling the dice i times can be defined as,

$$P\{X=i\} = P(i) = (1-p)^{i-1}\, p$$

here,

$$i = (012 \% 7) + 2 = 5+2 = 7$$

and $p = \frac{1}{6}$; as we are rolling a dice

$$\therefore P(7) = \left(1-\frac{1}{6}\right)^{6} \frac{1}{6}$$

$$= (0.833)^{6} \frac{1}{6} = 0.056$$

∴ Probability to get first "6" after rolling the dice 7 times is

~~5.07~~ 5.6%

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iii)

~~Here,~~

~~$i = (012 \% 7) + 2 = 5 + 2 = 7$~~

~~In order to get the first "6" the dice in order to it's needed to be rolled 7 times.~~

$$E[x] = \frac{1}{P} = \frac{1}{1/6} = 6$$

So ~~in order~~ the expected number of rolls we need to perform untill we get the first "6" is 6. In otherwords we will get the ~~"6"~~ first "6" on the 7th roll.

Answer to the Q. NO. 1(b)

i) ~~In~~ From the context we know that ~~when~~ a random variable Y is used to store the number of times I get 6. And after rolling N times I get 6 exactly i times. So here Y is a binomial random variable.

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ii)

Here,

$N = (012 \% 6) + 5 = 5$

$i = (012 \% 4) + 3 = ~~8~~ 3$

$$P(i) = \binom{N}{i} p^{i} (1-p)^{N-i}$$

$$\therefore P(3) = \binom{5}{3} \left(\frac{1}{6}\right)^{3} \left(1-\frac{1}{6}\right)^{5-3}$$

$$= {}^{5}C_{3} (0.0046)(0.833)^{2}$$

$$= 10 \times 0.0046 \times 0.694$$

$$= 0.032$$

here as we are rolling dice so $p = \frac{1}{6}$, ~~consi~~ considerin p is the probability of getting 6.

So if we roll the ~~dice~~ dice 5 times the probability of getting "6" for 3 times is 3.2 %.

iii)

we know for binomial expectation,

$$E[x] = Np = 5 \times \frac{1}{6} = 0.833$$

So if we roll the dice 5 time we are expected to get "6" 0.833 times

Ans.

Answer to the Q.No. 2(a)

Let

x_i = Today

x_{i+1} = Next day

So transition matrix:

$$A = \begin{array}{cc|ccc} & & \multicolumn{3}{c}{x_{i+1} \longrightarrow} \\ & & A & M & C \\ \hline x_i \downarrow & A & 0.74 & 0.24 & 0.02 \\ & M & 0.58 & 0.29 & 0.13 \\ & C & 0.46 & 0.37 & 0.17 \end{array}$$

Answer to the Q.No. 2(b)

Assuming

state, A = 0

state, M = 1

state, C = 2

Here,

$i = 012 \% 3 = 0$

$j = (12+2) \% 3 = 14 \% 3 = 2$

$N = (012 \% 4) + 3 = 3$

As the patient is in i=0 state that is A state today so $P(X_1) = \begin{array}{ccc}[1 & 0 & 0]\\ A & M & C\end{array}$

The probability of patient in j=2 that is C state, after N=3 days will be

$$P(X_4) = \cancel{[1\ 0\ 0]}\,[1\ 0\ 0] \times \begin{bmatrix} 0.74 & 0.24 & 0.02 \\ 0.58 & 0.29 & 0.13 \\ 0.46 & 0.37 & 0.17 \end{bmatrix}^3$$

~~= [0.74 0.24 0.02]~~

~~A M C~~

~~So after 3 day the patient will be in C stat with probability 2%~~

$$= [1\ 0\ 0] \times \begin{bmatrix} 0.6854 & 0.2591 & 0.0554 \\ 0.6765 & 0.2628 & 0.0605 \\ 0.6709 & 0.2652 & 0.0637 \end{bmatrix}$$

$$= \begin{array}{ccc}[0.6854 & 0.2591 & 0.0554]\\ A & M & C\end{array}$$

So after 3 day the patient will be in C stat with probability of 5.54%

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Answer to the Q.No-2 (c)

$i = 012 \% 3 = 0$

$$\begin{array}{c} \begin{bmatrix} 0.74 & 0.24 & 0.02 \\ 0.58 & 0.29 & 0.13 \\ 0.46 & 0.37 & 0.17 \end{bmatrix} \begin{array}{l} \rightarrow \times \pi_0 \\ \rightarrow \times \pi_1 \\ \rightarrow \pi_2 \end{array} \\ \begin{array}{ccc} .sum() & .sum() & .sum() \end{array} \end{array}$$

So from transition matrix we get,

$\pi_0 = 0.74\pi_0 + 0.58\pi_1 + 0.96\pi_2$ —— (i)

$\pi_1 = 0.24\pi_0 + 0.29\pi_1 + 0.37\pi_2$ —— (ii)

$\pi_2 = 0.02\pi_0 + 0.13\pi_1 + 0.17\pi_2$ —— (iii)

we know

$\pi_0 + \pi_1 + \pi_2 = 1$ —— (iv)

From (i), (ii) & (iii) we get,

$0.26\pi_0 - 0.58\pi_1 - 0.96\pi_2 = 0$ —— (v)

$-0.24\pi_0 + 0.71\pi_1 - 0.37\pi_2 = 0$ —— (vi)

$-0.02\pi_0 - 0.13\pi_1 + 0.83\pi_2 = 0$ —— (vii)

~~From~~

By solving (iv), (v), (vi) we get,

$\pi_0 = 0.682$

$\pi_1 = 0.26$

$\pi_2 = 0.057$

So the $P(X_{101}) = [0.682 \quad 0.26 \quad 0.057]$

So the probability that patient will be in A state after 100days is 68.2%

↳ As i=0.

Answer to the Q. No. 3(a)

Here,

$P(A_1)$ = Probability of manufacturer being $A_1 = \frac{1}{3}$

$P(A_2)$ = Probability of manufaturer being $A_2 = \frac{1}{3}$

$P(A_3)$ = " " " " $A_3 = \frac{1}{3}$

E is denoted by deffective PPE.

$\therefore P(E|A_1) = 20\% = 0.2$

~~$P(E|B) = 12\% = 0.12$~~

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$P(E|A_2) = 12\% = 0.12$

$P(E|A_3) = 18\% = 0.18$

i = [illegible] (012%3)+1 = 1

So, probability that the defective PPE was from company 1 or A_1 is,

$$P(A_1|E) = \frac{P(E|A_1)\,P(A_1)}{P(E|A_1)\,P(A_1) + P(E|A_2)\,P(A_2) + P(E|A_3)\,P(A_3)}$$

$$= \frac{0.2 \times \frac{1}{3}}{0.2 \times \frac{1}{3} + 0.12 \times \frac{1}{3} + 0.18 \times \frac{1}{3}}$$

$$= \frac{0.0667}{0.0667 + 0.04 + 0.06}$$

$$= \frac{0.0667}{0.1667} = 0.40$$

So the probability is 40%

Answer to the Q. No. 3(b)

~~Le~~
Let C be the event that the tested person has ~~canor~~ coronavirus and E is the event ~~that~~ that his ~~least~~ test result is positive. -

Here,

$$P(E|C) = 70\% = 0.7$$

$$P(C) = n\% = (12\%.3+4)\cancel{10}\% = 4\% = 0.04$$

$$P(E|C^c) = 5\% = 0.05$$

$$P(C^c) = 0.96$$

$$\therefore P(C|E) = \frac{P(CE)}{P(E)} = \frac{P(E|C)P(C)}{P(E|C)P(C) + P(E|C^c)P(C^c)}$$

$$= \frac{0.7 \times 0.04}{0.7 \times 0.04 + 0.05 \times 0.96}$$

$$= \frac{0.28}{0.28 + \cancel{0.488}\ 0.048}$$

$$= \frac{0.28}{0.328} = 0.854$$

The probability that a person has actually corona virus given that his test result is positive is ~~0~~ ~~85~~ 85.4% Ans.

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Answer to the Q. No. 4(a)

Here,

~~N= 012%3+4 = 0+4=4~~

$$N = ((012+2)\%10)+20$$
$$= 14\%10 + 20$$
$$= 4+20 = 24$$

from General algo of Josephus problem we know,

```
$D := 1$
while $D \le (q-1)n$:
        $D := \lceil \frac{q}{q-1} D \rceil$
```

$$J_q(N) = qN+1-D$$

Here,

q= ith person killed

N= Number of participents

D= ~~Normal Rand~~ Variable.

$J_q(N)$= Last man standing.

So,

$q=3;\ (q-1)n = 48$

$D = 1$

$\Rightarrow D = \left\lceil \frac{q}{q-1} D \right\rceil = 2$

$\Rightarrow D = \left\lceil \frac{q}{q-1} D \right\rceil = 3$

$\Rightarrow D = \left\lceil \frac{q}{q-1} D \right\rceil = 5$

$\Rightarrow D = 8$

$\Rightarrow D = 12$

$\Rightarrow D = 18$

$\Rightarrow D = 27$

$\Rightarrow D = 41$

$\Rightarrow D = 62$

~~Doing an extra iteration will result D = 61 which is > (q-1)n so we ~~loop~~ break the loop~~

$\therefore J_3(24) = 3\times 24 + 1 - 62$

$= 11$

So 11th person in the circle is the last man standing.

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Answer to the Q.NO. 4(b)

To find the number of disjoint areas we use the following eqn,

$L_n = 1 + \frac{n(n+1)}{2}$; where n is the number of lines.

Here,

$n = 5$

$\therefore L_5 = 1 + \frac{5(5+1)}{2} = 1 + \frac{30}{2} = 1 + 15 = 16$

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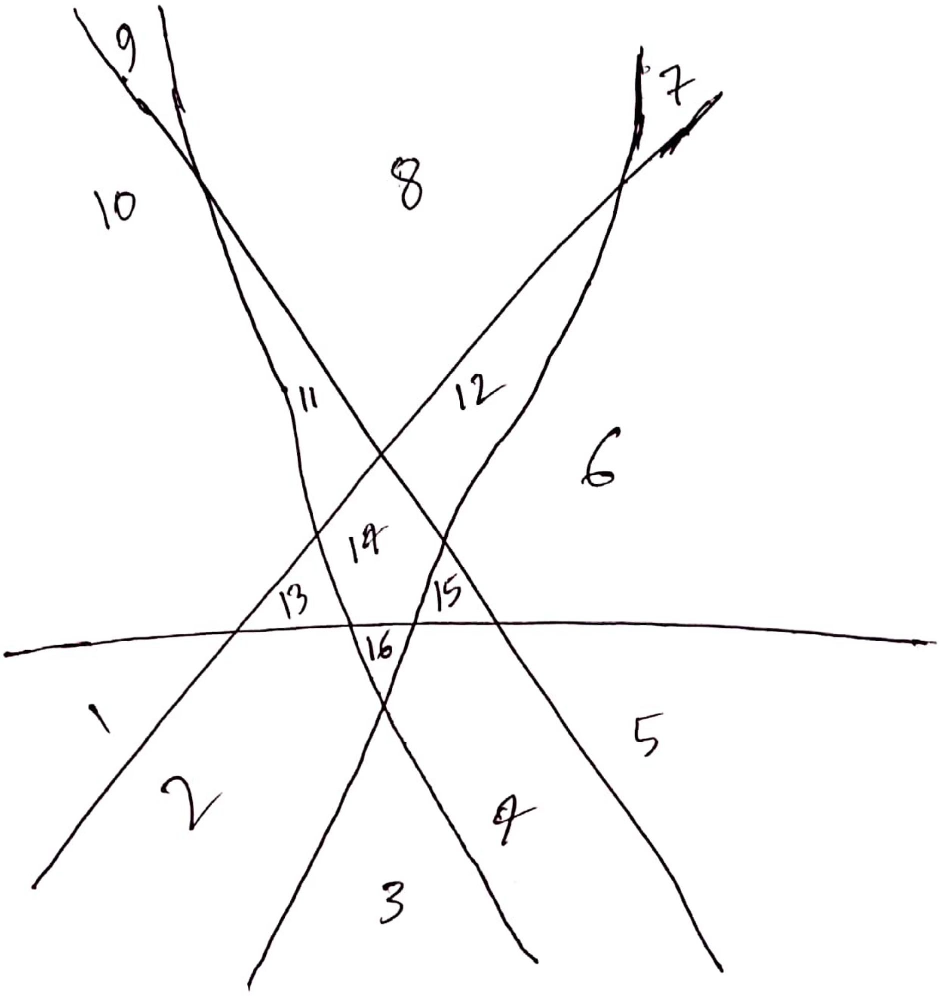

Fig. Lines