University of Asia Pacific

Admit Card

Final-Term Examination of Spring, 2020

Financial Clearance	PAID

Registration No : 17101038

Student Name : Nafisa Tasneem

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 401	Mathematics for computer Science	3.00	
3	CSE 403	Artificial Intelligence and Expert Systems	3.00	
4	CSE 404	Artificial Intelligence and Expert Systems Lab	1.50	
5	CSE 405	Operating Systems	3.00	
6	CSE 406	Operating Systems Lab	1.50	
7	CSE 407	ICTLaw, Policy and Ethics	2.00	
8	CSE 410	Software Development	1.50	
9	CSE 427	Topics of Current Interest	3.00	

Total Credit: 21.50

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.

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Admit Card Generation Time: 28-Oct-2020 09:54 AM

University of Asia Pacific

Department of Computer Science & Engineering

Final Term Examination: Spring-2020

Name : Nafisa Tasneem

Registration No : 17101038

Course code : CSE-403.

Course Title : Artificial Intelligence and Expert System.

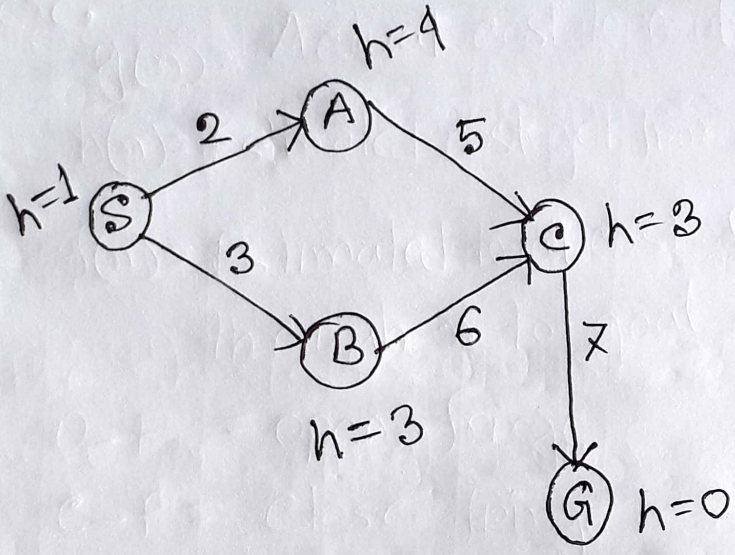
Semester : 1st

Year : 4th

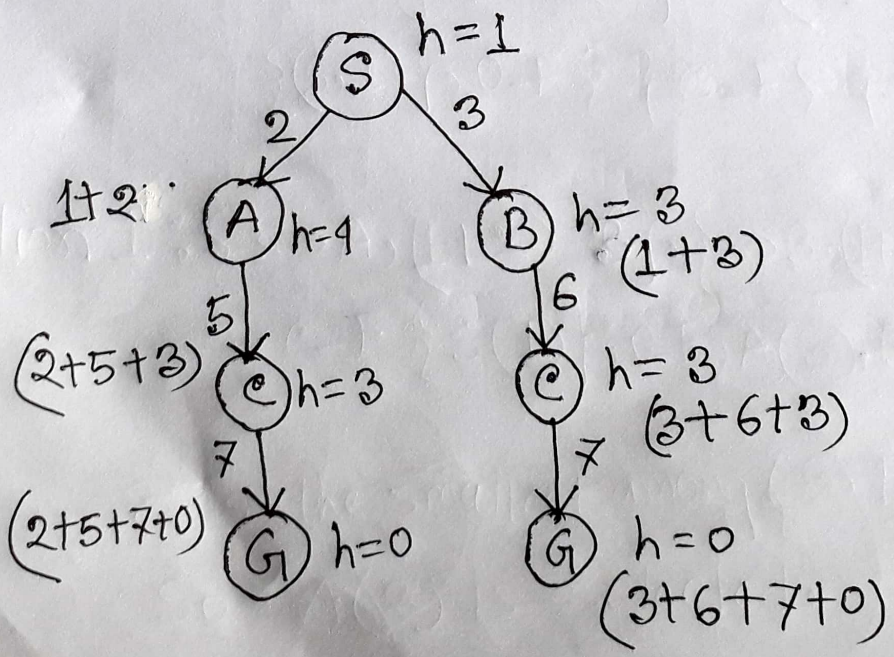
Date : 05.11.20

Answer to the question no. 1(b)

The given graph:



The corresponding Search Tree:



Here,

My id is ⇒ 17101038

∴ last 2 digit is ⇒ 38

The heuristic values of A, B, C be as follows:

$A = (38 \% 3) + 2$

$= 2 + 2$

$= 4$

$B = (38 \% 4) + 1$

$= 2 + 1$

$= 3$

$C = (38 \% 2) + 3$

$= 0 + 3$

$= 3$

Here,
we know,

$$f(n) = g(n) + h(n)$$

Here,

$g(n)$ = Actual cost to real node n

$h(n)$ = Estimated cost get from n to goal

$f(n)$ = Estimated total cost of path through n to goal.

O-F = open-fringe

C-F = close-fringe

Initialization : $\{S, g(s)+h(s)\} \rightarrow \{S, 0+1\} \rightarrow \{(S,1)\}$, O-F $\{\}$ C-F $\{\}$.

Iteration 1 : $\{S \rightarrow A, (1+2)=3\}, \{S \rightarrow B, (1+3)=4\}$,
C-F $\{S(1)\}$; O-F $\{A(3), B(4)\}$

∴ 3 is the smallest among $\{3, 4\}$
So, A(3) is selected.

Iteration 2:

{S → A → C, f(C) = g(C) + h(C) = 2+5+3 = 10},

C-F{S(1), A(3), B(4)}, O-F{B(4), C(10)}

Here, 4 is the smallest among {4, 10}

So, B(4) is selected.

Iteration 3:

{S → B → C, f(C) = g(C) + h(C) = (3+6+3) = 12},

C-F{S(1), A(3), B(4)}, O-F{C(10), C(12)}

Here, C(10) is the smallest among {10, 12}

So, C(10) is selected.

For next iteration.

Iteration 4:

{S → A → C → G, f(G) = g(G) + h(a) = (2+5+7+0)
= 14},

C-F{S(1), A(3), B(4), C(10)},

O-F{C(10), G(14)}

Here, 14 is the smallest among {10, 14}
And we can see that the node 'G' in the open fringe is the goal node in the given problem. So, we have reached our goal nod, G with cost 14 which is optimal.

∴ The shortest path is: S→A→B→C→G, where the optimal cost of the path is 14.

Answer to the question no: 2

My age is 23.

Given function, $f(x) = 3x - 1$

Population $A = 2$; So, $f(x) = 3A - 1 = 3 \times 2 - 1$
$= 5$

Population $B = 3$; So, $f(x) = 3B - 1 = 3 \times 3 - 1$
$= 8$

Population $C = (2 + 3) + 1 = 6$.

Population $D = C + \text{Min}(A, B) + 1$
$= 6 + (2, 3) + 1$
$= 9$

i = no. of population.

Selection:

String no.	Initial population	x value	Fitness f(x) = 3x-1	Probability	Expected count	Actual count
A	0010	2	5	0.089	0.356	0
B	0011	3	8	0.143	0.572	1
C	0110	6	17	0.304	1.216	1
D	1001	9	26	0.464	1.856	2
Sum			56	1	4	4
Average			14	0.25	1	1
Max			26	0.464	1.856	2

Fig: Selection.

Roulette Wheel:

Crossover:

String no	Mating pool	Crossover point	Offspring after Crossover	x value	Fitness $f(x) = 3x - 1$
B	001|0	3	0011	3	8
C	001|1	3	0010	2	5
D	01|10	2	0101	5	14
D	10|01	2	1010	10	29
Sum					56
Average					14
Max					29

Fig: Crossover.

Mutation:

string no	offsping after over	offspring after mutation	x value	Fitness $f(x)=3x-1$
B	0 0 1 1	1 0 1 1	11	32
C	0 0 1 0	0 0 1 1	2	5
D	0 1 0 1	0 1 0 1	5	14
D	1 0 1 0	1 1 1 0	14	41
Sum				92
Average				23
Max				41

Fig: Mutation.

Answer to the question no. 3

(a)

states X = {rain, sun}

initial distributation : 0.7 rain

CPT → conditional probability table :

CPT : $P(x_t | x_{t-1})$:

Sunday	Next day	Probability distribution
rain	rain	0.62
rain	sun	0.38
sun	rain	0.62
sun	sun	0.38

Here, My id is 38.

A = 1 - B = 1 - 0.38 = 0.62

B = 38/100 = 0.38

C = SQRT(38)/10 = 0.62

D = 1 - C = 1 - 0.62 = 0.38

$$P(X_2 = \text{rain}) = P(X_2 = \text{rain} \mid X_1 = \text{rain})\, P(X_1 = \text{rain}) + P(X_2 = \text{rain} \mid X_1 = \text{sun})\, P(X_1 = \text{sun})$$

$$= (0.62 \times 0.7) + (0.62 \times 0.3)$$

$$= 0.434 + 0.186$$

$$= 0.62$$

$$P(X_3 = \text{rain}) = P(X_3 = \text{rain} \mid X_2 = \text{rain})\, P(X_2 = \text{rain}) + P(X_3 = \text{rain} \mid X_2 = \text{sun})\, P(X_2 = \text{sun})$$

$$= (0.62 \times 0.62) + (0.62 \times 0.38)$$

$$= 0.3844 + 0.2356$$

$$= 0.62$$

∴ The probability of raining on Tuesday is 0.62.

3(b)

My id is 17101038.

$A = 38/100 = 0.38$

$B = 1 - A = 1 - 0.38 = 0.62$

$C = 0.576$

$D = 0.144$

$$P(\text{Cavity} \mid \neg \text{toothache}) = \frac{P(\text{Cavity} \wedge \neg \text{toothache})}{P(\neg \text{toothache})}$$

$$= \frac{0.38 + 0.62}{0.38 + 0.62 + 0.576 + 0.144}$$

$$= \frac{1}{1.72}$$

$$= 0.581.$$

Answer to the question no. 4(b)

Here,

$w_{13} = 0.3$, $w_{14} = 38\%3 - 0.5$

$= 2 - 0.5$

$= 1.5$

$w_{23} = 38\%2 - 0.2$

$= 0 - 0.2$

$= -0.2$

$w_{24} = 0.2$

$w_{35} = -0.4$

$w_{45} = 0.5$

Solve: Given input set $x = [1, 1]$, $d = [0, 1]$ desired output set $Y = [1, 0]$, let use at first find out the output at hidden layer.

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PQ: 14

① finding the output at hidden layer:

$$y_3^{(1)} = \text{sigmoid}(x_1 w_{13} + x_2 w_{23} - \theta_3)$$

$$= \text{sigmoid}(1 \times 0.3 + 1 \times (-0.2) - 0)$$

$$= \text{sigmoid}(0.2)$$

$$= \frac{1}{1+e^{+0.2}}$$

$$= 0.45$$

$$y_4^{(1)} = \text{sigmoid}(x_1 w_{14} + x_2 w_{24} - \theta_4)$$

$$= \text{sigmoid}(1 \times 1.5 + 1 \times 0.2 - 0)$$

$$= \text{sigmoid}(0.2)$$

$$= \frac{1}{1+e^{-0.2}}$$

$$= 0.349$$

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PG: 15

(2) Actual output at output level:

$$y_5 = \text{sigmoid}(y_3 \times w_{35} + y_4 \times w_{45} - \theta_5)$$

$$= \text{sigmoid}(0.45 \times (-0.4) + 0.349 \times 0.5) - 0)$$

$$= \text{sigmoid}(-0.0055)$$

$$= 0.5013$$

(3) Now calculating error at output level:

$$e_5 = 1 - y_5 = 1 - 0.5013$$

$$= 0.4987$$

(4) Now calculating error gradient:

$$\delta_5 = y_5 [1 - y_5] \times e_5$$

$$= 0.5013 [1 - 0.5013] \times 0.4987$$

$$= 0.5013 \times 0.4987 \times 0.4987$$

$$= 0.124$$

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PO:16

⑤ Now updating weights between output and hidden layer.

$$\Delta W_{35} = \alpha \cdot y_3 \cdot \delta_5$$

$$= 0.1 \times 0.45 \times 0.124$$

$$= 0.00558$$

$$\Delta W_{45} = \alpha \cdot y_4 \cdot \delta_5$$

$$= 0.1 \times 0.349 \times 0.124$$

$$= 0.00432$$

∴ Updated weight out of output layer W_{35} of the one iteration.

$$W_{35}^{(2)} = W_{35}^{(1)} + \Delta W_{35}$$

$$= -0.4 + 0.00558$$

$$= -0.39442$$