

University of Asia Pacific
Department of Computer Science & Engineering
Mid-Semester Examination Fall -2020
Program: B. Sc. Engineering (4th Year/ 1st Semester)

Course Title: Mathematics for Computer Science. Course No. CSE 401 Credit: 3.00
Time: 1.00 Hour. Full Mark: 60

There are **Four** Questions. **Answer three questions including Q-1 and Q-2.**

1. a. Suppose, we are working with the Josephus problem in which every third person is eliminated, instead of every second. Find out the solution for $J(N)$ by using the general solution of Josephus problem. [15]
Where $N = ((\text{Last 3 digit of your student Id} + 2) \bmod 10) + 20$
- b. Find out the GCD of the two numbers N_1, N_2 using the recursive equation. [5]
Where $N_1 = (\text{Last 3 digit of your student Id} + 5) \bmod 30 + 30$
 $N_2 = (\text{Last 3 digit of your student Id} + 10) \bmod 40 + 50$
2. a. Consider the roulette wheel with N slots, numbered 1 to N . Find out the possible number of winner when we play the game for N times. [15]
Where, $N = ((\text{Last 3 digit of your student Id}) \bmod 100) + 1050$
- b. Draw 4 lines in a plane to find out the maximum number of non-overlapping region. [5]
3. a. Let, we have a recursive equation [15]
$$T_0 = d_n$$
$$a_n T_n = b_n T_{n-1} + c_n$$

Where, $a_n = (\text{Last 3 digit of your student Id}) \bmod 5 + 1$
 $b_n = (\text{Last 3 digit of your student Id} + 1) \bmod 6 + 1$
 $c_n = (\text{Last 3 digit of your student Id} + 2) \bmod 7 + 1$
 $d_n = (\text{Last 3 digit of your student Id}) \bmod 2$

Simplify the aforementioned recursive equation by multiplying with a suitable summation factor to find the sum-recurrence form and finally solve the recurrence.

- b. Write the Sigma-notation and delimited form of the following statement. [5]
“The square sum of all the prime numbers between N_1 and N_2 ”
Where $N_1 = (\text{Student ID}) \bmod 100 + 200$ and $N_2 = N_1 + 1000$

OR

4. a. Let, we have a recursive equation: [15]

$$C_0 = N_1$$

$$(n+1)C_n = (n+2)C_{n-1} + N_2 \cdot (n+3)$$

Where, $N_1 = (\text{Last 3 digit of your student Id}) \bmod 4 + 1$

and $N_2 = (\text{Last 3 digit of your student Id}) \bmod 5 + 2$

Simplify the aforementioned recursive equation by multiplying with a suitable summation factor to find the sum-recurrence form and finally solve the recurrence.

- b. Write the Sigma-notation and delimited form of the following statement. [5]

“The sum of reciprocals of numbers between N_1 and N_2 ”

Where $N_1 = (\text{Student ID}) \bmod 100 + 150$ and $N_2 = N_1 + 1000$

University of Asia Pacific

Department of Computer Science & Engineering

Mid-Semester Examination Fall -2020

Program: B. Sc Engineering (4th Year/ 1st Semester)

Course Title: Artificial Intelligence & Expert Systems Course No. CSE 403/CSE 407 (Backlog)

Credit: 3.00

Time: 1.00 Hour.

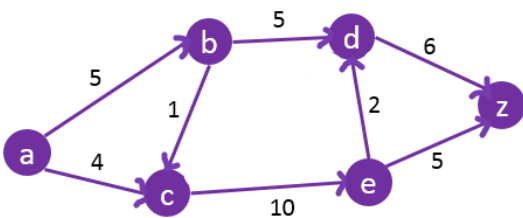
Full Marks: 60

There are **Four** Questions. Answer any **three including question Q-1 and Q-2**. All questions are of equal value. Figures in the right margin indicate marks.

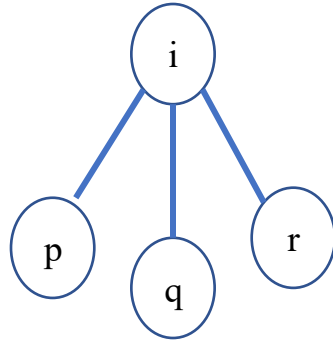
1. a) Suppose, you are developing a “Coffee Delivery Robot” for UAP CSE Faculty Lounge. Specify the **PEAS** description of your intelligent agent. 10
b) For the above agent, characterize the environment whether it is: 10
i) fully observable or partially observable, ii) deterministic or stochastic, iii) episodic or sequential, iv) static, dynamic, or semi-dynamic v) discrete or continuous, vi) single agent or multi-agent. Explain your answer.
2. Your target is to reach the goal node ‘z’ from start node ‘a’ with the most optimum cost. Simulate the following problem with **A* algorithm**, draw the search tree and determine the shortest path **with fringe** for **each iteration**. Assume that states with earlier alphabetical order are expanded first. The heuristic values of the 6 nodes are as follows: 20

$h(a) = (\text{Last 2 digits of your id}) \% 3 + 3$	$h(b) = (\text{Last 2 digits of your id}) \% 6 + 2$
$h(c) = (\text{Last 2 digits of your id}) \% 4 + 2$	$h(d) = (\text{Last 2 digits of your id}) \% 2 + 3$
$h(e) = (\text{Last 2 digits of your id}) \% 5 + 1$	$h(z) = 0$

Here % refers to **mod** operation. For example, if the last two digits of someone's id is 16 then

$h(a) = 16 \% 3 + 3 = 4$	
$h(b) = 16 \% 6 + 2 = 6$	
$h(c) = 16 \% 4 + 2 = 2$	
$h(d) = 16 \% 2 + 3 = 3$	
$h(e) = 16 \% 5 + 1 = 2$	
$h(z) = 0$	

3. a) Can you differentiate between intelligent agent and rational agent? State your own answer. 5
- b) Consider a state space where the start state is i and the successor function for state i return 3 states such as: p, q, r where $i = (\text{Last 2 digits of your id \% } 3) + 1$. Here \% refers to **mod** operation. 15



$$i = (\text{Last 2 digits of your id \% } 3) + 1$$

$$p = 3i - 1$$

$$q = 3i$$

$$r = 3i + 1$$

Here p, q, r are the child of node i and each p, q, r node will have its own 3 child in the next level.

For Example:

If someone's id is 35 then

$$i = 35 \% 3 + 1 = 2 + 1 = 3 \text{ (Root)}$$

$$p = 3 \times 3 - 1 = 9 - 1 = 8 \text{ (left child)}$$

$$q = 3 \times 3 = 9 \text{ (middle child)}$$

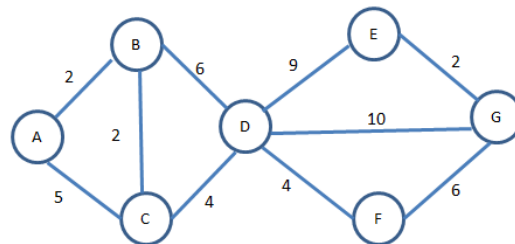
$$r = 3 \times 3 + 1 = 9 + 1 = 10 \text{ (right child)}$$

$$\text{Leaf node value} = i + 26 = 29$$

$$\text{Goal node value} = i + 25 = 28$$

- Draw a search tree from root node value i to leaf node value $(i + 26)$
- Suppose the goal state is $(i + 25)$. Find out the sequence/order in which the nodes will be visited for:
 - Breadth-First Search (BFS) and
 - Iterative Deepening Search (IDS)

4. a) "An AI agent interacts with its environment". Justify your answer with necessary diagram. 5
- b) Consider the following state space graph where A is the start state and G is the goal state. Suppose you are completing the heuristic function h_I shown below. All the values are fixed except $h_I(B)$. 15



Node	h_I
A	11
B	?
C	10
D	8
E	2.5
F	5.5
G	0

- Determine what values of $h_I(B)$ make h_I admissible?
- Determine what values of $h_I(B)$ make h_I consistent?

University of Asia Pacific
Department of Computer Science and Engineering
Mid-Semester Examination Fall-2020
Program: B.Sc. in CSE

Course Title: Operating System

Course No. CSE 405

Credit: 3.00

Time: 1.00 Hour.

Full Mark: 60 There are **Four** Questions. **Answer three questions including Q-1 and Q-2.**

1.	a.	<table><tr><td>Process</td><td>Burst Time</td><td>Arrival Time</td></tr><tr><td>A</td><td>5</td><td>6</td></tr><tr><td>B</td><td>8</td><td>5</td></tr><tr><td>C</td><td>3</td><td>1</td></tr><tr><td>D</td><td>9</td><td>0</td></tr></table> <p>Perform First come first served and Shortest job first CPU scheduling algorithm on the given scenario and prepare the Grant chart. Also find the average waiting time.</p>	Process	Burst Time	Arrival Time	A	5	6	B	8	5	C	3	1	D	9	0	[10+10]	CO3					
Process	Burst Time	Arrival Time																						
A	5	6																						
B	8	5																						
C	3	1																						
D	9	0																						
2.	a.	<table><tr><td>Process</td><td>Burst Time</td><td>Arrival Time</td><td>Priority</td></tr><tr><td>P</td><td>10</td><td>0</td><td>3</td></tr><tr><td>Q</td><td>6</td><td>2</td><td>2</td></tr><tr><td>R</td><td>7</td><td>3</td><td>1</td></tr><tr><td>S</td><td>2</td><td>1</td><td>2</td></tr></table> <p>Perform Priority scheduling algorithm and Round Robin CPU scheduling algorithm on the given scenario and prepare the Grant chart. Also find the average waiting time.</p>	Process	Burst Time	Arrival Time	Priority	P	10	0	3	Q	6	2	2	R	7	3	1	S	2	1	2	[10+10]	CO3
Process	Burst Time	Arrival Time	Priority																					
P	10	0	3																					
Q	6	2	2																					
R	7	3	1																					
S	2	1	2																					
3.	a.	What is an Operating System? What are the problems that we will face if we do not have any Operating System?	[10]	CO1																				
	b.	Is it possible to run more than one processes in a single CPU System? Explain how.	[10]	CO1																				
		OR	[10]	CO1																				
4.	a.	We are running various processes in our computers all the time. Why doesn't	[10]	CO1																				

		the main memory overload and crush?		
	b.	We know that in Regular Pipes, both the Read and Write descriptors are used by the same process. In this case how can we make it useful?	[10]	CO1

University of Asia Pacific
Department of Computer Science and Engineering
Mid-Semester Examination Fall-2020
Program: B.Sc. in CSE

Course Title: ICT Law, Policy and Ethics

Course No.: CSE 407

Credit: 2.00

Time: 1.00 Hour

Full Marks: 20

Answer any 2 (TWO) of the following questions.
(You MUST answer each part of a question consecutively)

1. Critically evaluate the relevant provisions of law which reflect that the Digital Security Act, 2018 propels the power of the Executive. (10)

2. Mr. Desire works in a software development firm in Bangladesh. He is also involved with Ms. Praise in a romantic relationship who happens to be the colleague of Mr. Desire. Ms. Praise is the in-charge of maintenance of the information infrastructure of the said firm. The information infrastructure stores a number of databases and information which are critical in nature and is responsible for public health. One such information is related to the development of a copyright protected software “Prattle” which is used by the mute people to communicate with others through data input. Currently, Mr. Desire is working on a prototype which requires some of the algorithmic information that were used in “Prattle”. He is going to present the prototype in a fortnight at the reputed conference to be held in Kolkata. He asked for help from Ms. Praise. Ms. Praise informed that the information is confidential. As the in-charge of maintenance she can certainly access the information, however, having strong work ethics, Ms. Praise denied to give the information to Mr. Desire. A fortnight later, Mr. Desire published his prototype stating the novelty of the work in the conference. Ms. Praise, having clear knowledge about the critical information stored in the firm’s infrastructure in Bangladesh, knew at once that the prototype is not novel and has a lot of copied algorithms from the “Prattle”. She cornered Mr. Desire and he confessed that he copied the information from the infrastructure while he went to see Ms. Praise at office. Analyse the situation and discuss the applicable legal rules and provisions. (10)

3. What is the need of having principles in the Code of Ethics for the Software Engineers? How are you going to ensure each principle at work as a software engineering professional? (10)

University of Asia Pacific
Department of Computer Science and Engineering
Mid-Semester Examination Spring-2020
Program: B.Sc. in Computer Science and Engineering
Course Title: Machine Learning Course No.: CSE 427 Credit: 3.00
Time: 1.00 Hour. Full Mark: 60
Instruction(s): Answer any three questions

1. a) Describe the basic components of the machine learning process with necessary diagram [10]
 b) What is the classification problem in machine learning? Explain using the following example data. [10]
 Score1 29 22 10 31 17 33 32 20
 Score2 43 29 47 55 18 54 40 41
 Result Pass Fail Fail Pass Fail Pass Pass Pass
2. a) Give the Basic of naive Bayes algorithm. How various probabilities are computed in naive Bayes algorithm? [5]
 b) Given the following data on a certain set of patients seen by a doctor, can the doctor conclude that a person having chills, fever, mild headache and without running nose has the flu? (Use naive Bayes algorithm to classify) [15]

chills	running nose	headache	fever	has flu
Y	N	mild	Y	N
Y	Y	no	N	Y
Y	N	strong	Y	Y
N	Y	mild	Y	Y
N	N	no	N	N
N	Y	strong	Y	Y
N	Y	strong	N	N
Y	Y	mild	Y	Y
3. a) Discuss linear regression with Ordinary Least Squares method. [5]
 b) In the table below, the x_i row shows scores in an aptitude test. Similarly, the y_i row shows statistics grades. If a student made an 83 on the aptitude test, what grade would we expect her to make in statistics?(Explain with obtaining a linear regression) [15]

Student	1	2	3	4	5
x_i	95	85	80	70	60
y_i	85	95	70	65	70
4. a) Use ID3 algorithm to calculate Gain for each feature for the data in the following table: [20]

Gender	Car ownership	Travel cost	Income level	Class
Male	0	Cheap	Low	Bus
Male	1	Cheap	Medium	Bus
Female	1	Cheap	Medium	Train
Female	0	Cheap	Low	Bus
Male	1	Cheap	Medium	Bus
Male	0	Standard	Medium	Train
Female	1	Standard	Medium	Train
Female	1	Expensive	High	Car
Male	2	Expensive	Medium	Car
Female	2	Expensive	High	Car