University of Asia Pacific

Department of Computer Science & Engineering

Mid-Semester Examination, Spring - 2022

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

Course Title: Mathematics for Computer Science **Course No.:** CSE 401 **Credit:** 3.0

Time: 1.00 Hours. **Full Mark:** 60

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

1. (a) Tanah rolls a 6-sided die. What will be the probability that he will get a prime number? [10]

   (b) In the dice rolling example, if you supposed that all six numbers were equally likely to appear, then what would you have? Explain your answer. [10]

2. (a) Consider the following Ackermann function: [15]

$$A(m,n) = \begin{cases} n+1, where, m = 0 \\ A(m-1,1), where, n = 0 \\ A\big(m-1, A(m,n-1)\big), otherwise \end{cases}$$

   Determine the value of A(3, last digit of your registration number) using appropriate formula.

   (b) Determine the expected value of getting head from the first coin toss. [5]

3. (a) Find out the Mean, Median and Mode of the given data set. [5*3 =15]

Dataset	
Data 1	20
Data 2	15
Data 3	16
Data 4	11

Data 5	10
Data 6	16

(b) Define Googol and Googolplex with exact values. [2.5*2 =5]

Or,

4. (a) A group of 500 people are standing in a circle, numbered consecutively clockwise from 1 to 500. Starting with person no. 2, we remove every other person, proceeding clockwise. Let j(n) denote the last person remaining in the Josephus problem, where, n is the total number of people. Compute j(n) using the general solution of Josephus problem. [15]

(b) Draw 6 lines in a plane to find out the maximum number of non-overlapping region. [5]

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Department of Computer Science and Engineering

Mid-Semester Examination Spring -2022

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

Course Title: Artificial Intelligence and Expert Systems Course No. CSE 403

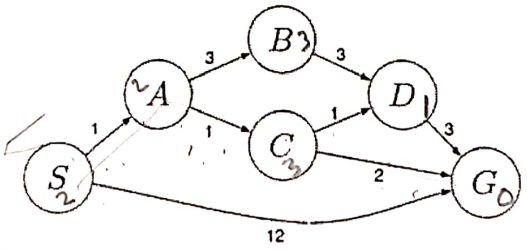
Credit: 3.00 Time: 1.00 Hour. Full Marks: 60 .

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

1. a) Suppose two intelligent agents playing chess, where one of them is called "Deep Blue" (AI agent), and the other is called Gary Kasparov (human being). Specify the **PEAS** for the agent "Deep Blue". [10]

   b) For the above agent, characterize the environment whether it is: i) fully observable or partially observable, ii) deterministic or stochastic, iii) episodic or sequential, iv) single agent or multi-agent. Explain your answer with your own logic. [10]

2. Suppose, your target is to reach the goal node 'G' from start node 'S' 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 if two nodes have the same evaluation value. The heuristic values, ***h(n)*** of the 6 nodes and the path costs, ***g(n)*** are as follows provided inside the graph. [20]

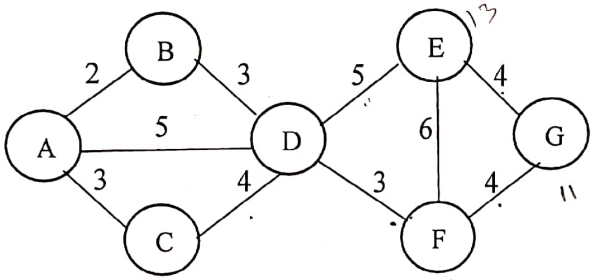


3. a) What is an expert system in artificial intelligence? State the main building blocks of an expert system with necessary diagram. [5]

   b) Generate a state space graph of 6 nodes. Determine the sequences/orders in which the nodes of a search tree will be visited for: [5+5 +5]
   i) Breadth-First Search (BFS)
   ii) Depth-First Search (DFS)
   iii) Iterative Deeping Search (IDS)

4. a) "Is AI different from machine learning (ML) and deep learning (DL)"? Explain. [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_2 shown below. All the values are fixed except $h_2(C)$. [15]



Node	A	B	C	D	E	F	G
h_2	9	7	?	5	3	3	0

i) Determine for which value of $h_2(C)$ makes h_2 admissible?

ii) Determine for which value of $h_2(C)$ makes h_2 consistent?

---End---

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Department of Computer Science & Engineering

Mid-Semester Examination Spring -2022

Program: B. Sc. Engineering

Course Title: Operating Systems Course No. 405 Credit: 3.00

Time: 1.00 Hours. Full Mark: 60

There are **Three** Questions. Answer all the questions. Figures in the right margin indicate marks.

1.a) "A process may be in different states during its execution." –Explain the statement with necessary diagram. 8

b) What is critical section problem? Define the requirements for the critical section problem solution. Explain mutual exclusion using Semaphore. 12

2.a) How a modern computer system works in context of CPU, Memory and I/O Devices? Explain with necessary diagram. 8

b) Describe the general method of passing parameters to the Operating System with necessary diagram. 12

3.a) Name and define the criteria for comparing CPU scheduling algorithms. 8

b) The following table indicates the processes and their parameters. Define and compare the SJFC and primitive priority scheduling using the table: 12

Processes	Burst time(Sec.)	Arrival time	Priority
P_1	9	3rd (sec.)	2
P_2	3	0th "	1
P_3	5	4th "	3
P_4	5	2nd "	0

Draw the Gantt charts for the above scheduling method (both preemptive and nonpreemptive) and find the average waiting time.

OR

a) Explain queuing diagram representation of process scheduling. 8

b) Describe Operating system services that provide functions to the user and functions for ensuring the efficient operation of the system itself via resource sharing. 12

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Department of Computer Science and Engineering
Mid-Semester Examination Spring 2022
Program: B.Sc. in Computer Science & Engineering
Course Title: ICT Law, Policy and Ethics
Course Code: CSE 407, Credit: 2.00
Time: 1 Hour Marks: 20

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

1. Ms. Rain is a software engineer and a movie addict. She downloads movies using torrent website. Her friend Mr. Wind, also a software engineer, helped her to open an account to get the pirated movies for free from the torrent website. In return, Ms. Rain agreed to help Mr. Wind to get access to a confidential file in her office. The file contained detailed information regarding a new and unpublished software which will help the blind people to see clearly using smart glasses. The algorithms for the software were already copyright protected. Ms. Rain, subsequently, copied the information of the said file from a password protected system and gave it to Mr. Wind. Considering the scenario took place in Bangladesh, analyse the given situation and discuss the applicable legal rules and provisions to Ms. Cloud and Mr. Thunder. (10)

2. Why do you think the software engineers should follow some ethics? What amendments or addition do you suggest in the joint ACM/IEEE-CS Software Engineering Code? (10)

3. Critically analyze the powers of the Government as mentioned under the Digital Security Act, 2018. (10)

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Department of Computer Science and Engineering

Mid-Semester Examination Spring-2022

Program: B.Sc. in CSE

Course Title: Machine Learning | Course No. CSE 427 | Credit 3.0

Time: 1.00 Hour | Full Mark: 60

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

1 a. Suppose your email program watches which email you do or do not mark as spam. Based on that, it learns how to better filter spam. Explain the concept of **supervised learning** and **classification problems** using the stated example. **[6x2=12]**

b. A big learning rate and a very small learning rate, both pose problems in updating parameter values effectively. Illustrate the reasons for it and provide a solution to overcome this problem using appropriate figures. **[4x2=8]**

2. a. Normalize the given dataset — **[5]**

x_1	x_2
3	150
6	540

b. We want to apply linear regression to predict the value of y using the given dataset. Our hypothesis function is: $\mathbf{h(\theta) = \theta_0 + \theta_1 x}$ and the learning rate, **alpha = 0.1** **[15]**

x	y
10	16
12	19
14	30

Initialize the value of θ_0 as the second last digit and θ_1 as the last digit of your student ID.
For Example, If your ID is 113026, then $\theta_0 = 2$ and $\theta_1 = 6$.

Your task is to determine the values of θ_0 and θ_1 after one iteration using gradient descent? (Consider values upto 2 decimal places)

3. We want to find a function through multivariate linear regression using the given dataset. Here, learning rate, **alpha = 0.01** **[20]**

x_1	x_2	y	y'	θ_0	θ_1	θ_2
11	4	13				
7	13	27				
13	8	17				
5	11	23				

Determine the hypothesis function and cost function for this regression problem. Consider, θ_0 = **p/5**, θ_1 = **p/4 and** θ_2 = **p/6**

Here, **p** = last three digits of your phone number.
For example, if your phone number is 01712610123, n = 123.

Complete all the steps and find the parameter values after one iteration and complete the table.

OR

Suppose we have a dataset as follows. **[20]**

x_1	x_2	y	z	$h_\theta(x)/g(z)$	y'
10	red	Apple			
8	yellow	Mango			
13	yellow	Mango			
2	red	Apple			

Given the dataset above, what kind of machine learning problem is this? Write down the equation of the hypothesis and Hyperbolic Tanh functions of the problem. Assume the values of θ_0 = **2**, θ_1 = **1 and** θ_2 = **3**.

Next, convert the discrete feature of the dataset. Then find the value for z, $g(z)$ and **y'** and complete the table using Hyperbolic Tanh function and decision boundary = **0.7**. Here, z is the parameter of the Hyperbolic Tanh function, $g(z)$ is the Hyperbolic Tanh function, **y'** is the predicted value.