Department of Computer Science & Engineering

University of Asia Pacific (UAP)

Program: B.Sc. in Computer Science and Engineering

Final Examination	**Fall 2020**	**4th Year 1st Semester**
Course Code: CSE 401	**Course Title: Mathematics for Computer Science**	**Credits: 3**
Full Marks: 120* (Written)		**Duration: 2 Hours**

* Total Marks of Final Examination: 150 (Written: 120 + Viva: 30)

Instructions:

1. There are **Four (4)** Questions. Answer all of them. All questions are of equal value. Part marks are shown in the margins.
2. Programmable calculators are not allowed.

1. **a)** Suppose, you are playing a game of "Ludo" where you cannot do anything until you roll the dice and the outcome is "6". Let, you are using a Random Variable ***X*** to store the number of times you need to roll the dice to get the first "6". 3+8+4

i) What is the type of random variable ***X***?

ii) What is the probability that you will need to roll the dice ***i*** times to get the first "6"?

iii) How many times are you expecting to roll the dice in order to get the first "6"?

Here, ***i*** = **(last 3 digits of your id mod 7) + 2**

b) Suppose, the rule of "Ludo" has changed and now initially you will roll the dice ***N*** times, and you have to get a "6" exactly ***i*** times. Let, you are using a Random Variable ***Y*** to store the number of times you get "6". 3+8+4

i) What is the type of random variable ***Y***?

ii) What is the probability that if you roll the dice ***N*** times, you will get "6" ***i*** times?

iii) How many times are you expecting to get "6", if you roll the dice ***N*** times?

Here, ***N*** = **(last 3 digits of your id mod 6) + 5**

Here, ***i*** = **(last 3 digits of your id mod 4) + 3**

2. **a)** Suppose, there are 3 possible states to classify a Covid-19 patient: Asymptotic (A), Moderate (M) and Critical (C). If a patient is Asymptotic today, the probabilities that he/she will be in A or M state the next day are 0.74 and 0.24 respectively. If the patient is in Moderate (M) state today, the probabilities that he/she will be in A or C state the next day are 0.58 and 0.13 respectively. Lastly, if the patient is in Critical (C) state today, the probabilities that he/she will be in M or C state the next day are 0.37 and 0.17 respectively. 4

Let, you want to model this scenario using Markov Chain. Write down the transition matrix for this.

b) Assume that, Asymptotic is state 0, Moderate is state 1, and Critical is state 2. 13

Now using the transition matrix from (a), find out if a patient is in state ***i*** today, what is the probability that he will be in state ***j*** after ***N*** days?
Here, ***i*** = **last 3 digits of your id mod 3**
j = **(last 3 digits of your id + 2) mod 3**
N = (**(last 3 digits of your id) mod 4)+ 3**

c) What is the probability that a patient will be in state ***i*** after 100 days? 13
Here, ***i*** = **last 2 digits of your id mod 3**

3. **a)** Suppose, there are 3 manufacturing companies that produce PPE. If company A_1, A_2 and A_3 produces PPE where there is 20%, 12% and 18% chances to be defective respectively. What is the probability that it was made by company A_i? 15
Here, ***i*** = **(last 3 digits of your id mod 3) + 1**

b) Corona test is 70% effective in detecting Covid-19 when it is positive (+ive). However, the test also shows a **False Positive** result for 5% of the healthy people. If ***n***% of the population actually has Corona virus, then what is the probability a person has actually Corona virus given that his test result is positive? 15
Here, ***n*** = **(last 3 digits of your id mod 3) + 4**

4. **a)** Suppose, you 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. 20
Where N = ((**Last 3 digit of your id +2**) mod 10) + 20

b) Draw the lines in plane problem for n = 5 and manually number the disjoint areas. Verify the correctness of your answer using the derived solution during our class. 10

OR

a) Let, we have a recursive equation $\mathbf{a_n T_n = b_n T_{n-1} + c_n}$ 20
Where, $\mathbf{a_n}$ **= (Last 3 digits of your id) mod 4 + 1**
$\mathbf{b_n}$ **= (Last 3 digits of your id +1) mod 4 + 1**
$\mathbf{c_n}$ **= (Last 3 digits of your id +2) mod 4 + 1**

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

b) Find the Josephus problem solution for n = (**Last 3 digits of your id**) using the odd-even recursive equation. 10

Department of Computer Science & Engineering

University of Asia Pacific (UAP)

Program: B.Sc. in Computer Science and Engineering

Final Examination	**Fall 2020**	**4th Year 1st Semester**
Course Code: CSE 403/407	**Course Title: Artificial Intelligence and Expert Systems**	**Credits: 3**
Full Marks: 120* (Written)		**Duration: 2 Hours**

* Total Marks of Final Examination: 150 (Written: 120 + Viva: 30)

Instructions:

1. There are **Four (4)** Questions. Answer all of them. All questions are of equal value. Part marks are shown in the margins.
2. Programmable calculators are not allowed.

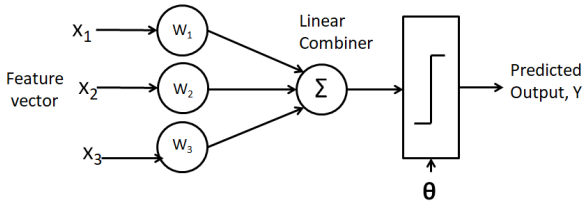
1. a) What do you mean by back propagation neural network (BPNN)? 5

b) For the following perceptron, the feature vector is X=[1 0 1] and the desired output Y=1. Consider step activation function with threshold θ = 0.2, learning rate α = 0.1. 25

i) **Measure** the predicted output and

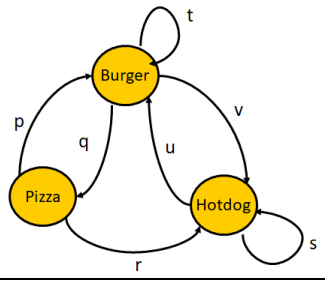
ii) Updated weights (W_1, W_2 and W_3) after one iteration.

W_1 =(Last 2 digits of ID) **mod** 2–0.2	W_2 =(Last 2 digits of ID) **mod** 3–0.5	W_3 =0.1



2. a) **Explain** query variable, evidence variable and hidden variable with example. 6

b) Suppose, the UAP Food Court serves pizza, burger and hotdog. The Probability Transition Matrix (A) is as follows. There are 3 states (pizza is state 0, burger is state 1 and hotdog is state 2). Let, burger is being served **today** {X_1= [0 1 0]}. What is the **predicted** probability that they will serve pizza on **3rd day**? If **someone's ID is 25** then the Transition Matrix (A) is as follows: 24



Probability Distribution

t = 1 – q = 1 - 0.025 = 0.975

$q = (Last\ 2\ digits\ of\ ID) \div 1000 = 25 \div 1000 = 0.025$

$p = \left(\sqrt{Last\ 2\ digits\ of\ ID}\right) \div 100 = (\sqrt{25}) \div 100 = 0.05$

r = 1 – p = 1 – 0.05 = 0.95

$$A = \begin{bmatrix} t & q & 0 \\ p & 0 & r \\ u & 0 & s \end{bmatrix}$$

$u = (Last\ 2\ digits\ of\ ID) \div 10000 = 25 \div 10000 = 0.0025$

s = 1 – u = 1 - 0.0025 = 0.9975

3. **a)** What are hedges in fuzzy logic? **Illustrate** how do hedges **modify** existing fuzzy sets? 4+6

b) A group of 5 students of CSE department have been found to be **very good** programmer with membership values: [A, B, C, D and E] respectively. **Estimate** what would be membership values in order to represent them to be: i) **extremely good** programmer and ii) **more or less good** programmer. Also **show** their graphical representation. 20

A = (Last 3 digits of id) **division** 1000	B = (Last 3 digits of id) **division** 2000
C = (Last 3 digits of id) **division** 4000	D = 1 - A
E = 1 - B	

4. Your plan is to execute the Genetic Algorithm (GA) for one run to solve a given problem **f(x) = 2x-1**. Consider 2 pairs of individuals (4 population like A, B, C and D), where the genotype representation (bit string) of the population are as follows: 30

Population A = 1st digit of your age	Population B = 2nd digit of you age
Population C = (A + B) + 1	Population D = C + Min(A, B) + 1

For example, if someone's **age** is **24**, then the value of the 4 populations will be as follows. In this case, the range of X is **X: 2 ~ 10**, so he/she may use **4-bit** representation.

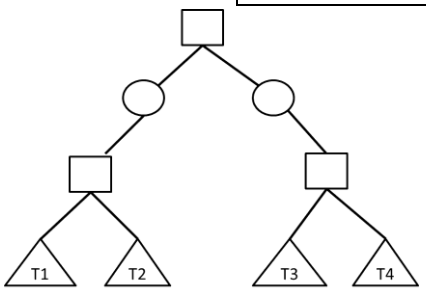
Population A = 2	Population B = 4
Population C = (2+4)+1 = 7	Population D = 7 + Min(2, 4) + 1 = 10

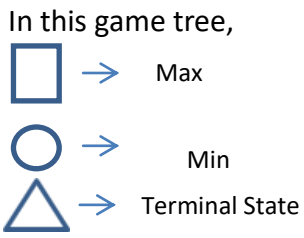
Execute the algorithm for one run explaining the 3 operators (selection, crossover and mutation) and **measure** the improve fitness value for each iteration. For selection, you may use Roulette-Wheel Technique.

OR

Your target is to prune the following game tree in order to improve the searching time efficiency. Which algorithm do you think is the best for this problem and what is the required condition for pruning? Consider the values of the terminal states as follows. **Illustrate** the step by step **pruning process** with **graphical representations**. 30

T1 = (Last 2 digits of ID) **mod** 3 + 2	T2 = - 7
T3 = - 2	T4 = T1 + 3





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Department of Computer Science & Engineering

University of Asia Pacific (UAP)

Program: B.Sc. in Computer Science and Engineering

Final Examination **Fall 2020** **4th Year 1st Semester**

Course Code: CSE 405 **Course Title: Operating Systems** **Credits: 3**

Full Marks: 120* (Written) **Duration: 2 Hours**

* Total Marks of Final Examination: 150 (Written: 120 + Viva: 30)

Instructions:

1. There are **Four (4)** Questions. Answer all of them. All questions are of equal value. Part marks are shown in the margins.
2. Non-programmable calculators are allowed.

1. Suppose, there are 5 processes P_0 through P_4; 3 resource types: *P* (11 instances), *Q* (6 instances), and *R* (8 instances). 30

Snapshot at time T_0:

	Allocation	*Max*
	P Q R	*P Q R*
P_0	1 2 1	8 6 4
P_1	3 1 1	4 3 3
P_2	4 1 3	9 1 3
P_3	3 2 2	3 3 3
P_4	1 1 3	5 4 4

Here, Available = the last three digits of your ID, BUT, mod each digit with 4. For example of the last 3 digit of your id is 198, then Available = 110, (1%4 = 1, 9%4 = 1, 8%4 = 0). Now, perform Bankers and determine if there is any Deadlock present in this scenario.

2. Take the reverse string of your student ID. Now append(join) it with your Student ID(The reverse string appear first). Now, suppose this represent the page requests for a system. Now, apply all the three page replacement algorithms on this scenario, where window size = 4, and analyze which algorithm is better and explain why. 30

3. **a)** 15

Process	Burst time	Priority	Arrival Time
A	5	8	0
B	2	5	2
C	8	5	3

D	7	2	1
E	15	1	2

Consider the given scenario. Now, apply pre-emptive priority scheduling, Round Robin (quantam = 3) and shortest job first for the given scenario and prepare the grant chart and calculate the average waiting time.

b) What are the fundamental differences between a simple function call and a System call? Explain both of their mechanism. 15

4. **a)** What are the different states of a process? Explain with diagram and an example. 15

b) Write short notes on: Pipes, Sockets. What is the difference between Shared memory and message passing models of IPC. 15

OR

a) What is a critical section problem? Explain the requirements for Solution for a Critical-Section Problem. Also explain race condition with example. 15

b) Write short notes on: Readers writers problem, Dining philosophers problem. 15

University of Asia Pacific

Department of Computer Science & Engineering

Semester Final Examination, Fall- 2020

Program: B.Sc. in Computer Science and Engineering, 4th Year 1st Semester

Course Title: ICT Law, Policy and Ethics

Course Code: CSE 407, Credit: 2.00

Time: 2 Hours Full Marks: 40

This is an Open Book Examination. You may consult study materials in developing your answer.

PART-I

Answer any **2 (TWO)** of the following questions.

(You MUST answer each part of a question consecutively)

1. Mr. Thunder is an amicable person and is very popular among his friends. He works at a film production house where his colleagues are also sympathetic towards him. Mr. Thunder has recently revisited the history of liberation war of Bangladesh and got inspired in making a movie on the same. He proposed the idea in front of his colleagues and everyone appreciated it. Consequently, he was given the responsibility starting from producing the film to sorting scripts and employ acting crews etc. While sorting the scripts, Mr. Thunder went to the Liberation War Museum in order to cross check the facts written on the scripts. However, the Museum denied to give any information of some specific events, stating, Mr. Thunder is not entitled to get such information. Mr. Thunder not bothering much about the authentic information, carried on with making the movie with the script written by Mr. Sky. The movie initially passed the censorship board and was released in Bangladesh on March 2020. After the initial release it was noticed that the movie contains such information which are contradictory to the spirit of liberation war. It also appeared to be based on a book which was originally written 3 decades ago. The author of the book is still alive and owns a copyright over the book. Explain the legal consequences for each of the incidents, persons and authorities involved in the given context. (15)
2. Critically evaluate the offences which provides for the highest punishment under the Digital Security Act, 2018. (15)
3. As a prospective software engineer give your opinion on the necessity of learning the laws relating to Information and Communication Technology, Intellectual Property and the Principles of Ethics for the software engineers. (15)
4. Create a fact relating to child pornography and thereby solve it by applying the Digital Security Act and the Pornography Control Act. (15)

PART-II

Answer any **1 (ONE)** of the following questions.

5. Discuss the necessity of the ACM-IEEE Code of Ethics for the Software Engineering professionals in Bangladesh. (10)
6. Mr. Ting Ting invented a prototype model which successfully passed the evolutionary prototyping. The prototype is basically used for teaching data sampling technique to the high school students. Mr. Ting Ting took help from a freelance ICT expert named Mr. Tutelage. Mr. Tutelage refined the model using latest and new algorithms. In this given context, write down the steps of registering a copyright for the model in Bangladesh and the responsibilities of Mr. Ting Ting under the ACM-IEEE Code of Ethics. (10)

Department of Computer Science and Engineering

University of Asia Pacific (UAP)

Program: B.Sc. in Computer Science and Engineering

Final Examination | **Fall 2020** | **4th Year, 1st Semester**

Course Code: CSE 427 | **Course Title: Machine Learning** | **Credits: 3.00**

Full Marks: 120* (Written) | **Duration: 2 Hours**

* Total Marks of Final Examination: 150 (Written: 120 + Viva: 30)

Instructions:

1. There are **Four (4)** Questions. Answer all of them. All questions are of equal value. Partial marks are shown in the margins.
2. Non-programmable calculators are allowed.

1. **a)** Name and define different activation functions in an artificial neuron with necessary expression and diagram. [10]

b) Explain the schematic representation of a perceptron. Design a two-layer network of perceptron to implement A AND B. [20]

2. **a)** Name and define the characteristics of an artificial neural networks. [10]

b) What is the basic idea of the backpropagation algorithm? Illustrate the various steps in the backpropagation algorithm, using a small network with two inputs, two outputs and one hidden layer. Assume that there are two observations: [20]

Sample	Input 1 i1	Input 2 i2	Output target 1 T1	Output target 2 T2
1	0.05	0.10	0.01	0.99
2	0.25	0.18	0.23	0.79

3. **a)** State the mathematical formulation of the SVM problem. Give the solution of the SVM problem. [10]

b) Give an outline of an algorithm to find the SVM classifier. Using the SVM algorithm, find the SVM classifier for the following data: [20]

Example no.	x1	x2	Class
1	2	1	+1
2	4	3	−1

4. **a)** What is criterion for minimization of error in Regression problem? [10]

b) State Bayes theorem and illustrate it with an example. Based on the following data determine the gender of a person having height 6 ft., weight 130 lbs. and foot size 8 in. (use naive Bayes algorithm). [20]

Person	height (feet)	weight (lbs)	foot size (inches)
male	6.00	180	10

male	6.00	180	10
male	5.50	170	8
male	6.00	170	10
female	5.00	130	8
female	5.50	150	6
female	5.00	130	6
female	6.00	150	8

Or,

4. **a)** Explain briefly the terms: Norm; Inner product; Angle between two vectors; Perpendicularity using following data: n=4; x=(-1, 2, 0, 3); y=(2, 3, 1, -4). [10]

b) Consider the following set of training examples: [20]

Instance	Classification	a1	a2
1	+	T	T
2	+	T	T
3	−	T	F
4	+	F	F
5	−	F	T
6	−	F	T

(i) What is the entropy of this collection of training examples with respect to the target function “classification”?

(ii) What is the information gain of a2 relative to these training examples?