

University of Asia Pacific

Department of Computer Science & Engineering

Mid-Semester Examination Spring 2019

Program: B. Sc. Engineering (4th Year/2nd Semester)

Course Title: Artificial Intelligence & Expert System Course No. CSE-407

Time: 1.00 Hour

Credit: 3.00

Full Marks: 60

There are **Four** Questions. Answer any **Three**. All questions are of equal value/Figures in the right margin indicate marks.

- Q.1**
- a) What are early and present visions of artificial intelligence. (6)
 - b) Explain Turing mechanism to test a machine is intelligence or not? (6)
 - ~~c) Correlate among belief, hypothesis and knowledge.~~ (8)
- Q.2**
- a) Explain knowledge acquisition, representation, manipulation and resolution. (10)
 - b) Design and describe a simple rule-based expert system. (10)
- Q.3**
- a) With the help of two agents explain how conflict resolution can be performed. (10)
 - b) Represent the following knowledge using graph OR frame.
Samina Chowdhury, the daughter of Mahmudun Nabi and Rashida Chowdhury, is a renowned singer. She was born in Dinajpur on 1968. She prefers to sing classical and modern songs.
- Q.4**
- a) Classify intelligent agents. (6)
 - b) Write short notes on:
No Hands Across America (7)
 - c) Represent using Prolog.
Mr. John is a programmer. He achieved his PhD from Simon University. We, the students, learned lots from him. (7)

Best of Luck

Department of Computer Science & Engineering

Mid-Semester Examination Spring-2019

Program: B. Sc. Engineering (4th Year/ 2nd Semester)

Course Title: VLSI Design Course No.: CSE 441

Credit: 3.00

Time: 1.00 Hours.

Full Mark: 60

There are **Four** Questions. Answer any **Three**. Figures in the right margin indicate marks.

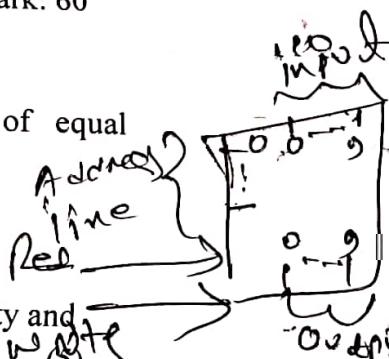
1. a) Explain the following terms in MOS 10
i. Carrier
ii. Velocity
iii. Mobility
- b) Explain the following steps in CMOS Fabrication 10
i. Annealing
ii. LOCOS
2. a) What is etching? What are the different techniques? 10
b) Explain the importance of clock in circuits? Define hard and soft barriers with proper diagrams. 10
3. Derive Ideal I-V equations in CMOS. 20
Clearly show Cutoff, Linear and Saturation in your derivation. You must show your work with elaborate explanation.
4. For the following function derive Stick diagram. You must clearly show schematic, Euler's path and stick diagram. Clearly mark interesting points in your answer. 20

$$\text{Out} = (\overline{X}C + \overline{X}D)(A + B)$$

There are **Four** Questions. Answer any **Three**. All questions are of equal value/ Figures in the right margin indicate marks.

1.

- a) Draw the computer memory hierarchy. Clearly indicate the relative capacity and speed of each storage medium. (5)
- b) Draw the block diagram of a 64K*10 RAM. How many address line and data line it will have? What is its capacity in Byte? (6+2+2)
- c) Define various types of ROM. (5)



2.

- a) Design a combinatorial circuit using a ROM. The circuit accepts a two-bit number (X) and outputs a binary number equal to the cube (X^3) of the input number. Draw the truth table and circuit diagram. (5+5)
- b) Write the steps of interrupt execution in ATMEGA32. (10)

For Q3

Q = 0

1 = 1

0 = 0

1 = 1

1 = 0

1

1

3.

- a) How pipelining is done in ATMEGA32. (5)
- b) What is single cycle ALU Operation in ATMEGA32. (5)
- c) Write the steps to write a byte in the EEPROM of ATMEGA32. (10)

4.

Design a warning system using a piezo speaker and a TMP36 sensor. You need measure temperature continuously. If temperature is greater than 35 degree Celsius, the speaker should beep for 2 seconds. The TMP36 sensor outputs a 10-bit number. It outputs 250mV at 0 degree and 500mV at 25 degree.

- a) Draw the circuit diagram. (5)
- b) Show the calculation for temperature measurement. (5)
- c) Write Arduino code for your system. (10)

CSE 435

Computer Interfacing (4-2)

Class Test 1

Total marks: 20

Time: 40 Minutes

Name:

ID:

Section:

1. Consider a 128K*12 RAM
 - a) What is its's capacity in Byte? (2)
 - b) How many bit it will have in address line and data line? (2)
 - c) Draw it's block diagram. (6)

**Department of Computer Science & Engineering
University of Asia Pacific (UAP)**

Final Examination Fall 2018

4th 2nd Semester

Course Code: CSE 411

Course Title: VLSI Design

Credits: 3

Full Marks: 150

Duration: 3 Hours

Instructions:

1. There are Eight (8) Questions. Answer any Six (6). All questions are of equal value. Part marks are shown in the margins.
2. Non-programmable calculators are allowed.

1. a. What is MOS capacitor? ✓ 05
- b. Draw cross section view of a CMOS circuit. ✓ 05
- c. With the help of a graph, show the relationship of Capacitance and Voltage (C-V) in a conventional CMOS circuit. ✓ 15
2. a. Draw schematic of the following Equation 05
$$\text{Out} = AB + CD + E$$
- b. Find Euler Path for 2 (a). 05
- c. Find Stick Diagram from 2 (b). Clearly show connections, use different color and line weight to denote different elements in the stick diagram. 15
3. a. Write down the steps involved in CMOS fabrication. ✓ 05
- b. What are the objectives of scaling in technology? ✓ 05
- c. In a figure, draw the I-V curve of both Ideal and non-ideal. *Searah* 15
You must clearly mark the interesting parts of the graph, label each part and clearly draw important features.
4. a. What is robustness of a CMOS Circuit? ✓ 05
- b. What is bathtub curve? Explain with the help of a diagram. ✓ 05
- c. "Due to two factors, in practice we don't get the theoretical result of I-V"- is this statement true? Elaborately discuss Velocity Saturation and Mobility Degradation. ✓ 15

4. Briefly explain coffee cart analogy in VLSI non-ideal IV characteristics. 05
5. What is the effect of Electric Field in a MOS? 05
6. Explain the following in details with diagram 15
- LOCOS
 - Gate Oxide Growth
6. a. Explain the following formula used for Mobility degradation - 05

$$\mu_{\text{eff}-n} = \frac{540 \frac{\text{cm}^2}{\text{V} \cdot \text{s}}}{1 + \left(\frac{V_{gs} + V_t}{0.54 \frac{\text{V}}{\text{nm}} t_{ox}} \right)^{1.85}}$$

$$\mu_{\text{eff}-p} = \frac{185 \frac{\text{cm}^2}{\text{V} \cdot \text{s}}}{1 + \left| \frac{V_{gs} + 1.5V_t}{0.338 \frac{\text{V}}{\text{nm}} t_{ox}} \right|}$$

- b. What are three conditions for Alpha-Power Model for cutoff, linear and saturation? 05

With diagram explain Accumulation, Depletion and Inversion. 15

7. a. Write three sources of current leakage sources in conventional CMOS circuit. 05
- b. Why do we need clocks in our circuit? Briefly explain by comparing different available circuits. 05
- c. In a table, show relationship of voltages in three regions of operations in Complementary Metal Oxide Semiconductor. 15
8. a. What are MTBF and FIT in a robustness analyzed circuit? ✓ 05
- b. What is IC? Briefly discuss IC manufacture process. 05
- c. Derive Shockley's First order equation. ✓ 15

Department of Computer Science & Engineering
University of Asia Pacific (UAP)

Final Examination	Spring 2018	4 th Year 2 nd Semester
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Course Code: CSE 411

Course Title: VLSI Design

Credits: 3

Full Marks: 150

Duration: 3 Hours

Instructions:

1. There are Eight (8) Questions. Answer any Six (6). All questions are of equal value. Part marks are shown in the margins.
2. Non-programmable calculators are allowed.

1. a) Draw a simple MOS and clearly mark all the interesting parts in the diagram. 05
b) What is threshold voltage? If a component has a threshold voltage of 0.3V, what does it mean? 05
c) With the help of a diagram, explain important points of MOS capacitors Capacitance vs Voltage (C-V) characteristics. 15
2. a) What are carrier and mobility in CMOS circuit? Give example. 05
b) Consider an nMOS transistor in a 65 nm process with a minimum drawn channel length of 50 nm. Assume, $W/L = 4/2 \lambda$ (i.e., 0.1/0.05 μm). In this process, the gate oxide thickness is 10.5 Å. Estimate the high-field mobility of electrons to be $80 \text{ cm}^2/\text{V} \cdot \text{s}$ at 70°C . The threshold voltage is 0.5 V. Plot I_{ds} vs. V_{ds} . $V_{gs} = 0, 0.2, 0.4, 0.8, \text{ and } 1.0 \text{ V}$ using the long-channel model. 20
3. a) Briefly explain why circuits need clocks? 05
b) Define the following terms with the help of a graph 05
a. Hold Time
b. Setup Time
c. Clock to Q Delay Time
c) What will be output result if an 8-bit register with a value of 31 is the input of a Flip-flop and the clock pulse is 1010 1010. 15
What would be the output if it were to be replaced by a latch?
4. a) What is yield in chips? 05
Explain the formula: $Y = e^{-\sqrt{(A.D)}}$
b) Define the following with diagram during CMOS fabrication 10
a. Photoresist Coating
b. Exposure
c. Development
d. Etching
e. Ion Implant
c) What is scaling in chips? Describe three objectives in scaling and how is scaling achieved in VLSI technology. 10

5. a) What is logical effort? Explain delay in logic gate? 10
b) Prove that a X-input NAND gate will always have a certain logical effort. Clearly show your work and circuit diagram. 15
6. a) What is compound gate? Give three different examples. 05
b) Draw schematic diagram of $F = A \cdot B + C$ 05
c) Draw Euler's path and Stick diagram for the above function. 15
7. a) What is pass transistor? Draw circuit as example. 05
b) What is transient response? Explain briefly. 05
c) Explain briefly with a diagram 15
a. Rising Propagation Delay
b. Falling Propagation Delay
c. Average Propagation Delay
d. Fall Time
e. Rise Time
f. Rising Contamination Delay
g. Falling Contamination Delay
h. Average Contamination Delay
8. Derive Shockley's First order equation. Use a simple CMOS diagram to show your parameters, derive cut-off, Linear and Saturation part of your work and clearly show the work. 25

Department of Computer Science & Engineering

Mid-Semester Examination Spring-2019

Program: B. Sc. Engineering (4th Year/ 2nd Semester)

Course Title: VLSI Design Course No.: CSE 441

Credit: 3.00

Time: 1.00 Hours.

Full Mark: 60

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$$\text{Out} = (\overline{X_C + X_D})(\overline{A + B})$$

**Department of Computer Science & Engineering
University of Asia Pacific (UAP)**

Final Examination Fall 2018 4th Year 2nd Semester

Course Code: CSE 407

Course Title: Artificial Intelligence

Credits: 3

Full Marks: 150

Duration: 3 Hours

Instructions:

1. There are Eight (8) Questions. Answer any Six (6). All questions are of equal value. Part marks are shown in the margins.
2. Non-programmable calculators are allowed.

make a machine to
imitate human behavior

✓ 1. a) What do mean by intelligence? Also describe the goal of Artificial Intelligence (AI). (5)

b) Explain the test mechanism to determine the intelligence of a machine. Discuss briefly about AI winter period. (10)

c) Briefly describe a successful AI project during its booming period and also an important failure of AI. (10)
Intro - 9 + 16

✓ 2. a) Define knowledge, meta-knowledge and hypothesis. Also give examples of each. (5)

b) What is an expert system? Design and describe a simple rule-based expert system. (10)

c) With the help of two agents explain how conflict resolution can be performed. (10)

✓ 3. a) What is meant by intelligent agent? Discuss the important properties of an intelligent agent. (10)

b) Explain the PEAS description of an autonomous medical diagnosis system. (10)

c) Briefly describe four classifications of intelligent agent. (5)

✓ 4. a) Explain deductive logic and inductive logic with examples. (5)

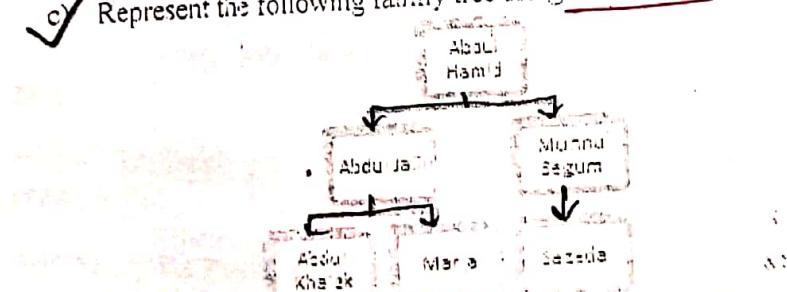
b) Convert the following sentence into a logical expression;
"You can access the Internet from campus only if you are a computer science major or you are not a freshman." (10)

c) What is natural language processing? Explain how knowledge can be represented using (15)
(i) frame, (ii) associative net.

✓ 5. a) Differentiate between propositional and predicate knowledge. (5)

b) Consider a state space where the start state is 1 and the successor function for the state n returns two states, numbers $2n$ and $2n+1$. Now goal state will be the first prime number of your list, in $30 < \text{prime number (goal state)} < 50$. List the order in which nodes will be visited for the iterative deepening search strategy. (10)

c) Represent the following family tree using PROLOG (10)



2. 3

2+4 5

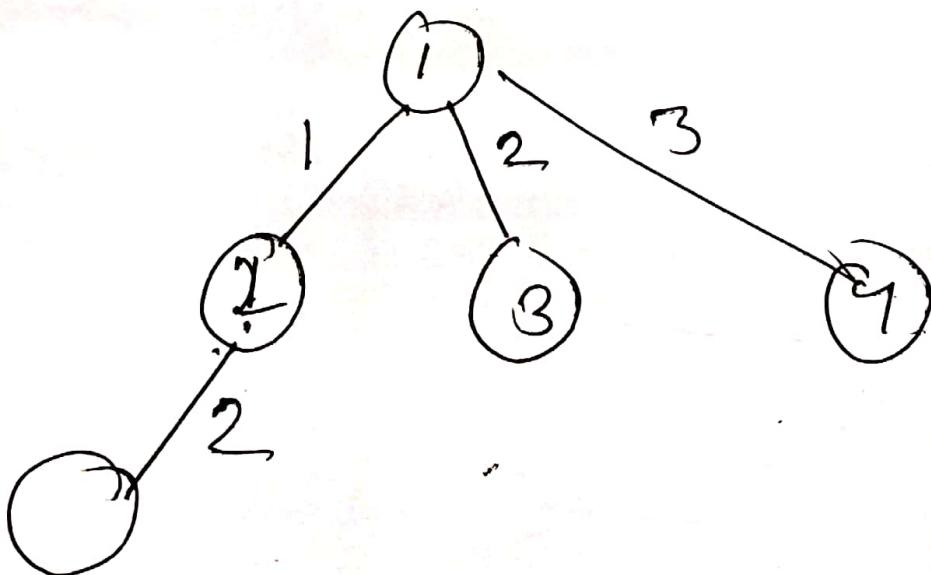
6. a) Explain greedy and A* search techniques from objective function perspective. (7)
- b) Describe game theory citing example of tic-tac-toe game. (18)
7. a) Explain two main genetic operators: cross-over and mutation. Why mutation is important? (10)
- b) It is necessary to optimize (maximize) the following function. Genetic algorithm is a good way to optimize this function. Show the fitness for the first two generations. (15)

$$f(x) = \frac{x^3 - 7}{1 + 5x^2}, \quad 0 \leq x \leq 255$$

8. a) Differentiate between fuzzy and probability citing an example. (5)
- b) Explain fuzzy modifiers with examples? Draw some standard fuzzy membership functions. (10)
- c) A four-person family wants to buy a house. An indication of how comfortable they want to be is the number of bedrooms in the house. But they also want a large house. (10)

Let $u = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ be the set of available houses described by their number of bedrooms. Use fuzzy sets C (for comfortable) and L (for large). Design a fuzzy system that can make decision on the basis of C and L for an optimum house for the above family.

→ P19



Department of Computer Science & Engineering
University of Asia Pacific (UAP)

Final Examination Spring 2018 4th Year 2nd Semester

Course Code: CSE 407

Course Title: Artificial Intelligence

Credits: 3

Full Marks: 150

Duration: 3 Hours

Instructions:

1. There are **Eight (8) Questions**. Answer any **Six (6)**. All questions are of equal value. Part marks are shown in the margins.
2. Non-programmable calculators are allowed.

1. a) Describe the goal of Artificial Intelligence (AI). (5) 05
b) Explain the test mechanism to determine the intelligence of a machine. Discuss briefly about AI winter period. (10) 15
c) Write short notes on two successful Ai projects during its booming period. (10) 15
2. a) Define knowledge, meta-knowledge and hypothesis. Also give examples of each. (10)
b) What is an expert system? Design and describe a simple rule-based expert system. (10)
c) With the help of two agents explain how conflict resolution can be performed. (5)
3. a) Define intelligent agent. Discuss the important properties of an intelligent agent. (10)
b) Explain the PEAS description of an autonomous taxi. (10)
c) Briefly describe the generic classifications of intelligent agents. (5)
4. a) Write short notes on the following: (10)
(i) Deductive logic and inductive logic
(ii) Propositional and predicate logic
- b) Represent the following knowledge using logic or PROLOG: (15)
If Tom feels hungry, then he eats quickly. If he eats quickly, he gets heartburn.
If he gets heartburn, he takes medicine. Tom feels hungry.
- After representing the fact using logic or PROLOG, show that Tom is taking medicine.
5. a) Explain uninformed and informed search techniques. (5)
b) Consider a state space where the start state is 1 and the successor function for state n returns two states, numbers $2n$ and $2n+1$. Now suppose the goal state is 24. List the order in which nodes will be visited for the iterative deepening search strategy. (10)
- c) Discuss the basic principle of game theory. Explain the mechanism of Tic-Tac-Toe game. (10)
6. a) Explain gradient, greedy and A* search techniques from objective function perspectives. (15)
b) Describe Modus Ponens and Modus Tollens with examples. (10)
7. a) Explain two main genetic operators. Why mutation is important? (10)
b) It is necessary to optimize (maximize) the following function. Genetic algorithm is a good way to optimize this function. Show the fitness for the first two generations. (15)

$$f(x) = \frac{x^3 - 7}{1 + 5x^2}, \quad 0 \leq x \leq 255$$

8. a) Differentiate between fuzzy and probability citing an example. (5)
- b) Explain fuzzy modifiers with examples? Draw some standard fuzzy membership functions. (10)
- c) A four-person family wants to buy a house. An indication of how comfortable they want to be is the number of bedrooms in the house. But they also want a large house. (10)

Let $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ be the set of available houses described by their number of bedrooms. Use fuzzy sets C (for comfortable) and L (for large). Design a fuzzy system that can make decision on the basis of C and L for an optimum house for the above family.

University of Asia Pacific
Department of Computer Science & Engineering
Mid-Semester Examination Spring 2019
Program: B. Sc. Engineering (4th Year/2nd Semester)

Course Title: Artificial Intelligence & Expert System Course No. CSE-407 Credit: 3.00
Time: 1.00 Hour Full Marks: 60

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- Q.3 a) With the help of two agents explain how conflict resolution can be performed. (10)
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 Samina Chowdhury, the daughter of Mahmudun Nabi and Rashida.
 Chowdhury, is a renowned singer. She was born in Dinajpur on 1968. She
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- Q.4 a) Classify intelligent agents. (6)
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 Mr. John is a programmer. He achieved his PhD from Simon University.
 We, the students, learned lots from him. (7)

Best of Luck

* Fall 17 - 4(c)

Samina

7

Department of Computer Science & Engineering

University of Asia Pacific (UAP)

Final Examination Spring 2019 4th Year 2nd Semester

Course Code: CSE 411

Course Title: VLSI Design

Credits: 3

Full Marks: 150

Duration: 3 Hours

Instructions:

1. There are Eight (8) Questions. Answer any Six (6). All questions are of equal value. Part marks are shown in the margins.
2. Non-programmable calculators are allowed.

- | |
|---|
| <p>1. a. Draw lateral view of a CMOS. 05
 b. Explain lithography in CMOS fabrication process? 05
 c. Describe any three steps in CMOS fabrication process? Use diagram and relevant details where applicable. 15</p> <p>2. a. Write down the equations in Shockley's first order models. 05
 b. Describe linear progression of current vs. voltage in a CMOS circuit briefly. 05
 c. Prove that in CMOS circuit 15</p> <p style="margin-left: 40px;">$I_{ds} = \beta (V_{gs} - V_t - V_{ds}/2) V_{ds}$</p> <p style="margin-left: 40px;">Where the symbols carry conventional meaning.</p> <p style="margin-left: 40px;">Show your work clearly and elaborate where applicable.</p> <p>3. a. What are hard and soft barriers? 05
 b. What is yield? Explain its implication briefly. 05
 c. For the given Input and Clock 15</p> <p style="margin-left: 40px;">Input: 100101 Clock: 011010</p> <p>Find out</p> <p>i) Latch Output and briefly discuss how you arrived at that output
 ii) Flip-flop Output and briefly discuss how you arrived at that output</p> |
| <p>4. a. Explain the following formula 05</p> $Y = e^{-\sqrt{A \cdot D}}$ <p>b. Describe delay in a logic gate. 05
 c. With the help of a table, show the relationship among voltages and currents in a regular MOS capacitor. Explain relevant terms in details. 15</p> |

8

5. a. Describe robustness in conventional CMOS circuits (such as Pen drive)?

05

b. What is 'bathtub curve' in a device's life-cycle?

05

c. Given,

$$F = \overline{(AB+C)D}$$

15

Find out

i) Schematic diagram

ii) Euler's path

6. a. Explain accumulation and depletion with proper diagram.

10

b. Show that for n-input, any NAND gate circuit will have a certain logical effort.

15

You should use conventional symbols and signs; explain in details wherever appropriate.

7. a. What is etching? Describe briefly two popular techniques that are used for etching.

10

b. In practice, we see that our I-V curve is slightly different than theoretical derivation. Why is that?

15

What are the reasons behind it? Explain in details.

8. Find out equivalent function using Reed-Muller Expansion

25

$$F(x, y, z) = x' y' z' \oplus x y' z \oplus x y$$

Hint: Use Table 01; Find out only A₁ and A₃.

Table 01

X	Y	Z	output	function
0	0	0	1	F(0)
0	0	1	0	F(1)
0	1	0	0	F(2)
0	1	1	0	F(3)
1	0	0	0	F(4)
1	0	1	1	F(5)
1	1	0	1	F(6)
1	1	1	1	F(7)

**Department of Computer Science and Engineering
University of Asia Pacific (UAP)**

Final Examination Spring 2019 4th Year, 2nd Semester

Course Code: CSE 437

Course Title: Pattern Recognition

Credits: 3.00

Full Marks: 150

Duration: 3 Hours

Instructions:

1. There are Eight (8) Questions. Answer any Six (6). All questions are of equal value. Partial marks are shown in the margins.
 2. Write the answer as precise as possible without altering the fact.
1. (a) Determine whether the following dataset is linearly separable or not, using Support Vector Machine learning algorithm—

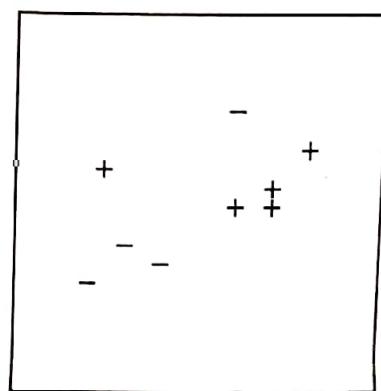


Fig. 01: 2D dataset for Support Vector Machine.

If this dataset is linearly NOT separable, then what kind of Kernel function should we use to classify the '+' and '-' datasets. Explain with equations.

- (b) Mention whether Support Vector Machine is supervised or unsupervised learning algorithm. [2]
- (c) Mention the input(s) and output(s) of Support Vector Machine learning algorithm. [5]
- (d) Determine the name of the logic gate it simulates by the following Artificial Neural Network— [12]

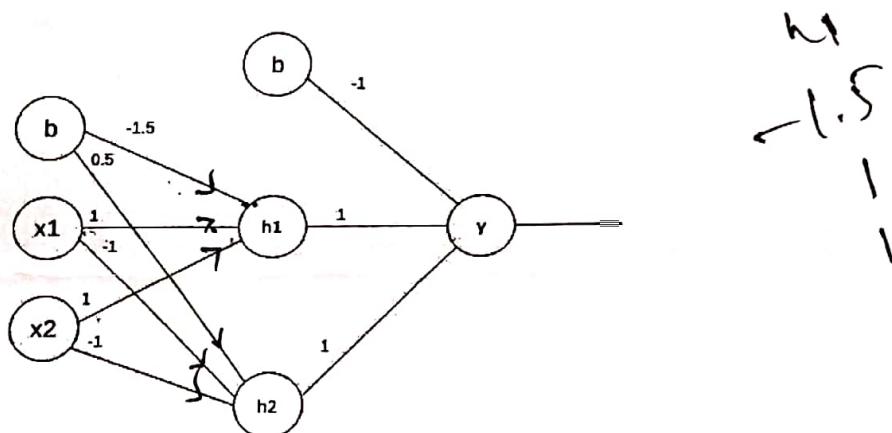


Fig. 02: Implementation of a logic gate using Artificial Neural Network.

2. Suppose you have the following training data set, and the hypothesis function is given as— [10]

$$h_{\theta}(x) = \theta_0 + \theta_1 * x_1 + \theta_2 * x_2 \text{ where, } \theta_0 = 1, \theta_1 = 0.5, \theta_2 = 1$$

The value of x_1, x_2 and y are given as follows—

x_1	x_2	y
1	0.5	2
1	1.5	3
2	1	4
3	1	4

Now determine the value of $J(\theta_0, \theta_1, \theta_2)$. Where, the notations indicate their traditional meaning.

- (b) Suppose you are working on cancer detection problem, and using an algorithm to predict whether a tumor size will be considered as a positive cancer detection or negative cancer detection. Would you treat this problem as a classification or a regression problem? Explain your answer. [5]

- (c) The primal formulation of Support Vector Machine is described as— [10]

$$L(w, b, \lambda) = \frac{1}{2} \|w\|^2 - \sum_{i=1}^n \lambda_i [y_i(w^T x_i + b) - 1]$$

Optimality given as—

$$w = \sum_{i=1}^n \lambda_i y_i x_i \text{ and } \sum_{i=1}^n \lambda_i y_i = 0$$

Where, the notations indicate their traditional meaning. Now, convert this primal problem to its dual formulation.

3. (a) Illustrate hyper-plane, support vector points, width and margin in terms of Support Vector Machine. Indicate these terms in a single drawing. [8]
- (b) Mention three types of Kernel functions associated with non-linear Support Vector Classifier. [9]
- (c) Explain what types of Kernel Function is necessary to classify the following dataset— [8]

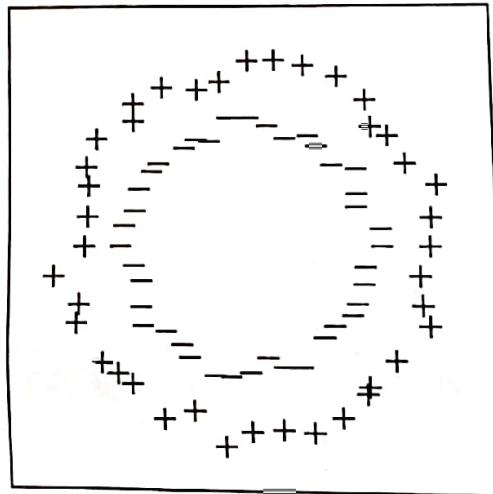


Fig. 03: 2D dataset for nonlinear Support Vector Machine.

4. (a) Describe the steps of reducing the dimensions of a dataset from n to k , where $n > k$. You can assume that, singular value decomposition is a built-in function and it can be obtained by the [10]

(3)

following line of code—

$$[U, S, V] = svd(\text{Sigma})$$

Where, Sigma is the covariance matrix of your raw dataset.

- (b) Mention the reasons of why we need Support Vector Machine to classify non-linearly [5] separable dataset, even we have polynomial regression algorithm to classify them.

(c) Determine the maximum value of the function $f(x, y, z) = x + y + 2z$, using Lagrange [10] Multipliers method, where there is a constraint to satisfy, and the constraint is defined as $x^2 + y^2 + z^2 = 3$.

5. Suppose you designed a prediction algorithm that can predict whether a person has dengue or not. You examined 1000 persons data. Now, the prediction result and the actual result is indicated as follows— [12]

- i. Number of persons has dengue and predicted the same – 12.
- ii. Number of persons has dengue and predicted the opposite – 6.
- iii. Number of persons does not have dengue and predicted the same – 974.
- iv. Number of persons does not have dengue and predicted the opposite – 8.

Now, create the confusion matrix indicating True Positive, True Negative, False Positive and False Negative. Also determine the precision, recall and F_1 score.

- (b) Describe the relation between Receiver Operating Characteristics (ROC) and Area under the [8] Curve (AUC) in a single plot drawing.

- (c) Describe the properties of the solution ' p ' of a Lagrange Multiplier solution. [5]

6. (a) Prove that, $\frac{d}{dx}\{g(x)\} = g(x) * (1 - g(x))$. Where, $g(x)$ is defined as $g(x) = \frac{1}{1+e^{-x}}$. [7]

- (b) Determine whether the following actions will fix high bias or high variance— [6]

- i. Adding features.
- ii. Getting more training examples.
- iii. Adding polynomial features.
- iv. Trying smaller set of features.

- (c) Suppose the following dataset is given as follows— [12]

Outlook	Temp.	Humidity	Wind	Play
Sunny	Hot	High	Weak	No
Sunny	Hot	High	Strong	No
Overcast	Hot	High	Weak	Yes
Rainy	Mild	High	Weak	Yes
Rainy	Cool	Normal	Weak	Yes
Rainy	Cool	Normal	Strong	No
Overcast	Cool	Normal	Strong	Yes
Sunny	Mild	High	Weak	No
Sunny	Cool	Normal	Weak	Yes
Rainy	Mild	Normal	Weak	Yes
Sunny	Mild	Normal	Strong	Yes
Overcast	Mild	High	Strong	Yes
Overcast	Hot	Normal	Weak	Yes
Rainy	Mild	High	Strong	No

Predict the label or class of the following instance using Naïve Bayes theorem from the table.

$x' = (\text{Outlook} = \text{Sunny}, \text{Temperature} = \text{Mild}, \text{Humidity} = \text{High}, \text{Wind} = \text{Strong})$

Here, 'Play' column indicates the output class.

(u)

7. (a) Describe how to determine the value of 'k' in k-means clustering algorithm with the necessary plot illustration. [7]
- (b) From the dataset given in question 6(c), determine the information gain of the attribute 'Temp.' [8]
- (c) Describe the steps of how weights and threshold values are updated 'between hidden and output layer' and 'between input and hidden layer' in Backpropagation algorithm. [10]

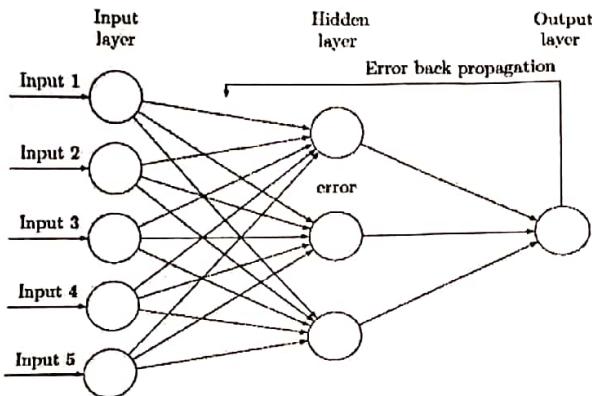


Fig. 04: Illustration of Backpropagation algorithm.

N.B.: Please DO NOT write the whole algorithm. Write precisely as it is asked.

8. (a) Apply pooling and normalization (using ReLU) operations associated with Convolutional Neural Network for the following 2D array— [12]

0.77	-0.11	0.11	0.33	0.55	-0.11	0.33
-0.11	1.00	-0.11	0.33	-0.11	0.11	-0.11
0.11	-0.11	1.00	-0.33	0.11	-0.11	0.55
0.33	0.33	-0.33	0.55	-0.33	0.33	0.33
0.55	-0.11	0.11	-0.33	1.00	-0.11	0.11
-0.11	0.11	-0.11	0.33	-0.11	1.00	-0.11
0.33	-0.11	0.55	0.33	0.11	-0.11	0.77

Fig. 05: 2D array input feed for pooling and normalization in ConvNet.
Assume that, pooling window is 2*2.

- (b) Describe how Widrow-Hoff delta rule is applied in single neuron perceptron learning [6] algorithm.
- (c) Draw and indicate the mimication between a human neuron and a single neuron perceptron. [7]

9

**Department of Computer Science & Engineering
University of Asia Pacific (UAP)**

Final Examination Spring 2019 4th Year 2nd Semester

Course Code: CSE 407

Course Title: Artificial Intelligence

Credits: 3

Full Marks: 150

Duration: 3 Hours

Instructions: There are Eight (8) Questions. Answer any Six (6). All questions are of equal value. Part marks are shown in the margins.

1. Non-programmable calculators are allowed.

1. a) What do mean by intelligence? Also describe the goal of Artificial Intelligence (AI). (5)

b) Explain the test mechanism to determine the intelligence of a machine. Discuss briefly about AI winter period. (10)

c) Briefly describe a successful AI project during its booming period and also an important failure of AI. (10)

2. a) Correlate among belief, hypothesis and knowledge. (5)

b) What is an expert system? Design and describe a simple rule-based expert system. (10)

c) With the help of two agents explain how conflict resolution can be performed. (10)

3. a) What is meant by intelligent agent? Discuss the important properties of an intelligent agent. (10)

b) Explain the PEAS description of an autonomous medical diagnosis system. (10)

c) Briefly describe four classifications of intelligent agent. (5)

4. a) Explain deductive logic and inductive logic with examples. (5)

b) Convert the following sentence into a logical expression;
"You can access the Internet from campus only if you are a computer science major or you are not a freshman." (5)

5. a) What is natural language processing? Explain how knowledge can be represented using (i) frame, (ii) graph. (15)

b) Explain greedy and A* search techniques from objective function perspective. (5)

b) Consider a state space where the start state is 1 and the successor function for the state n returns two states, numbers $2n$ and $2n+1$. Now goal state will be the first prime number of your list in $30 < \text{prime number (goal state)} < 50$. List the order in which nodes will be visited for the iterative deepening search strategy. (10)

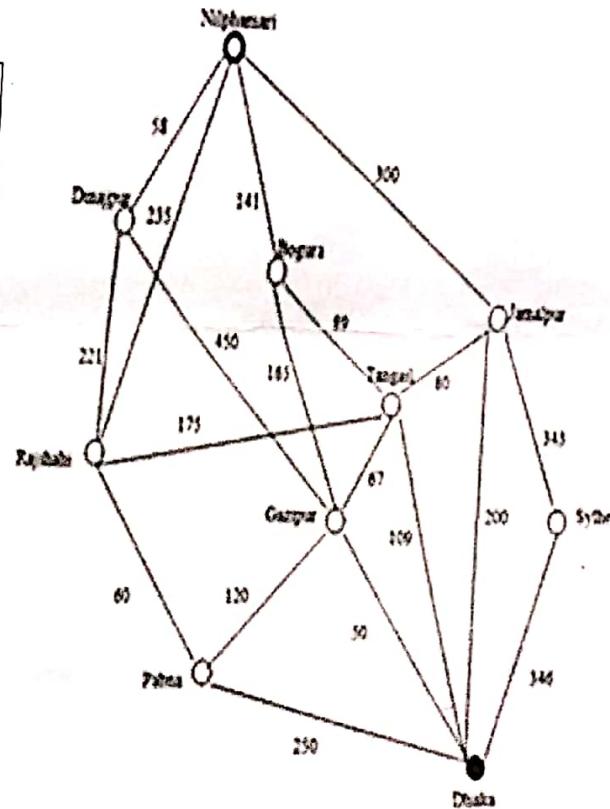
6. a) Represent the following knowledge using PROLOG (10)

Samina Chowdhury, the daughter of Mahmudun Nabi and Rashida Chowdhury, is a renowned singer. She was born in Dinajpur on 1968. She prefers to sing classical and modern songs.

6. (a) Differentiate between propositional and predicate knowledge. (5)

(b) Suppose you are in Nilphamari as illustrated in Figure 1. From the uninformed search strategies which one of the searching algorithm you will choose to reach the capital city of (20)

Table 1: Straight line distance to Dhaka	
Nilphamari	200
Dhaka	0
Dinajpur	169
Rajshahi	120
Pabna	75
Gazipur	30
Tangail	70
Sylhet	118
Jamalpur	150
Bogura	130



7. a) Explain two main genetic operators: cross-over and mutation. Why mutation is important? (10)

b) It is necessary to optimize (maximize) the following function. Genetic algorithm is a good way to optimize this function. Show the fitness for the first two generations. (15)

$$f(x) = \frac{x^2 - 10}{1 + 5x}, \quad 0 \leq x \leq 255$$

8. a) Differentiate between fuzzy and probability citing an example. (5)
- b) Explain fuzzy modifiers with examples? Draw some standard fuzzy membership functions. (10)
- c) Write down the concept of game theory. Also describe the algorithm of adversarial search. (10)

5

Department of Computer Science & Engineering

University of Asia Pacific (UAP)

Final Examination Spring 2019 4th Year 2nd Semester

Course Code: CSE 435

Course Title: Computer Interfacing

Credits: 3

Full Marks: 150

Duration: 3 Hours

Instructions:

1. There are Eight (8) Questions. Answer any Six (6). All questions are of equal value. Part marks are shown in the margins.
2. Non-programmable calculators are allowed.

1. a) Harry potter is preparing for the upcoming Quidditch World Cup. This time he wants 20 to install an Arduino based system in his broomstick, so that if any other player is near him, he will be warned instantly. He went to Hermione for help. Hermione thinks Harry should use HC-SR04 ultrasonic sensor and a piezo speaker for his project. Explain how can harry build his Arduino based system. Draw circuit diagram and write Arduino code. 5
- b) What is a digital input pin? 5
2. a) Design a warning system using a piezo speaker and a TMP36 sensor. You need 20 measure temperature continuously. If temperature is greater than 35 degree Celsius, the speaker should beep for 2 seconds. The TMP36 sensor outputs a 10-bit number. It outputs 250mV at 0 degree and 500mV at 25 degree. Draw circuit diagram and write Arduino code. 5
- b) What are the differences between SRAM and DRAM? 5
3. a) What are the differences between synchronous and asynchronous data transfer? 5
What is programmed I/O? What is its drawback? 8
4. a) Draw the block diagram of a DMA controller. 12
- Why is Input Output Interface required in a computer? 8
Explain destination-initiated strobe signal with block diagram and timing diagram 12
5. a) What is the drawback of strobe signal? 5
- b) Define DMA burst and cycle stealing. 5
What is asynchronous serial transfer? How does it work? 10
Draw the block diagram and sequence diagram of source-initiated handshaking. 10

6

What are the steps of A/D conversion? Explain with figure.

10

For a 10-bit ADC $V_{ref} = 5$ V. Calculate the D0-D9 output if analog input is:

10

I. 3.4V

II. 2.6V

Why we need A/D converter in microprocessor-based system?

5

7. a)

What are the registers used in EEPROM of ATMEGA32? Draw every register and explain their purposes.

15

b)

What is Harvard architecture?

5

c)

How pipelining is done in ATMEGA32?

5

8. a)

Draw the block diagram of a RAM and describe its components.

10

b)

Design a combinational circuit using a ROM. The circuit accepts a three-bit number and outputs a binary number equal to the square of the input number. Clearly specify the truth-table and circuit diagram.

5

c)

Define primary memory and secondary memory.