



Jagannath University

Dept. of Computer Science and Engineering

Four Year First Semester Examination: Mid Term 1, 2022

Course Title: Artificial Intelligence Course Code: CSE-4101

Time: 1 Hours Full Marks: 10

[Attempt all the questions]

1 (a) Define with example the following terms: i) Agent function ii) Agent program 1

(b) Suppose you have developed a program to solve geometric analysis problems 3
that appear in IQ tests. On several occasions it is found that your program
responds more efficiently and intelligently with respect to human response.
Would we then conclude that a program is more intelligent than human?
Explain.

(b) Consider the following rules for estimating a project risk. 6

Rule: 1 IF x is A3 OR y is B1 THEN z is C1	Rule: 1 IF project_funding is adequate OR project_staffing is small THEN risk is low
Rule: 2 IF x is A2 AND y is B2 THEN z is C2	Rule: 2 IF project_funding is marginal AND project_staffing is large THEN risk is normal
Rule: 3 IF x is A1 THEN z is C3	Rule: 3 IF project_funding is inadequate THEN risk is high

Suppose the value of each input and output of the Fuzzy Inference System
ranges from 0 to 10. Estimate risk of the project showing each step of Fuzzy
Inference System if project funding (x) is 6 and project staffing (y) is 8.

Jagannath University

Dept. of Computer Science and Engineering

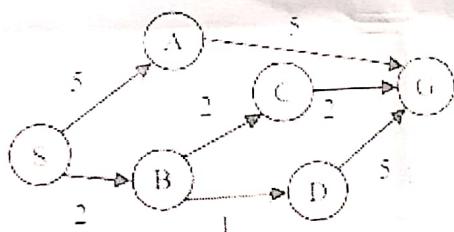
Four Year First Semester Examination: Mid Term II, 2022

Course Title: Artificial Intelligence Course Code: CSE-4101

Time: 1 Hours Full Marks: 10

[Attempt all the questions]

- I (a) How to define a problem formally? Explain why problem formulation must follow goal formulation. 1
- (b) Consider a state space where the start state is number 1 and the successor function for state n returns two states, number $2n$ and $2n + 1$. 3
- I. Draw the portion of the state space for states 1 to 15.
 - II. Suppose the goal state is 11. List the order in which nodes will be visited for breadth first search, depth-limited search with limit 3, and iterative deepening search.
- (b) Consider the following search space where we want to find a path from the start state S to the goal state G. The table shows three different heuristic functions h_1 , h_2 and h_3 . 6



Node	h_1	h_2	h_3
S	0	5✓	0
A	0	3✓	5
B	0	4	2
C	0	2	5
D	0	5	3
G	0	0	0

- I. What solution path is found by Greedy Best-first search using h_2 ? Break ties alphabetically.
- II. What solution path is found by Uniform-Cost search? Break ties alphabetically.
- III. Give the three found by algorithm A* using each of the three heuristic function, respectively. Break ties alphabetically.

Jagannath University

Department of Computer Science and Engineering

4th year 1st semester B.Sc. Engineering Final Examination 2021

Course Title: Artificial Intelligence Course Code: CSE-4101

Time: 3 hours

Full Marks: 70

[Answer any five (05) of the following questions]

✓ (a) Define intelligence. What is the intelligent behavior of a machine? 2+2 = 4

(b) Suppose you have developed a program to solve geometric analysis problems that appear in IQ tests. In several occasions it is found that your program responds more efficiently and intelligently with respect to human response. Would we then conclude that a program is more intelligent than human? Justify your answer. 5

(c) What is an agent? Explain the function of learning agent. 1+4 = 5

2. (a) Suppose the database initially includes facts A, B, C, D and E, and the knowledge base contains only three rules: 4+2 = 6

Rule 1: IF Y is true AND D is true THEN Z is true	Rule 2: IF X is true AND B is true AND E is true THEN Y is true	Rule 3: IF A is true THEN X is true

Apply the forward chaining to fire the rules given in the above table. Distinguish between forward chaining and backward chaining inference process.

(b) What is conflict resolution in the rule's firing? What are the different ways to resolve conflict in a rule-based expert system? 4

(c) Suppose we have already obtained the following knowledge about animals, which are rules of inference: 4

- I. If it has *fur* and says *woof*, then the animal is a **dog**.
- II. If it has *fur* and says *meow*, then the animal is a **cat**.
- III. If it has *feathers* and says *quack*, then the animal is a **duck**.

Now, write an expert system to help you identify animals using Prolog or LISP programming.

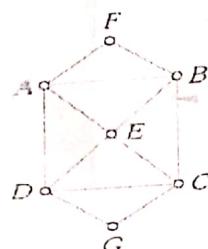
3. (a) A* is a best-first search for $f(n) = g(n) + h(n)$ where $g(n)$ is the cost to reach the node n and $h(n)$ is a heuristic function from the node n to the goal. Now, given that the graph is a tree, choose special functions $g(n)$ and $h(n)$, as general as possible, that will make A* search become 2×3 = 6

- I. Breadth-first search
 II. Depth-first search
 III. Uniform-cost search
- (b) For each statement about Hill Climbing below, decide whether it's true or false, and give a one-sentence justification.

- I. There can be more than one global optimum.
 II. It is possible that every state is a local optimum. (A local optimum is defined to be a state that is no better than its neighbors.)
 III. Hill climbing with random restarts is guaranteed to find the global optimum if it runs long enough on a finite state space.

$2.5 \times 2 = 5$

- (c) Find the Hamiltonian Circuit from the given graph.

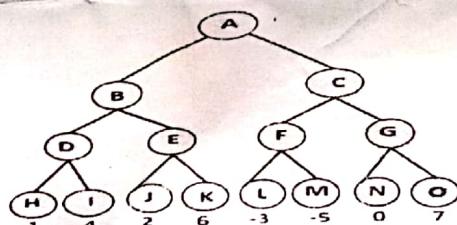


Describe the following approaches to solve the travelling sales man problem

- I. The repetitive nearest neighbor algorithm.
 II. The cheapest link algorithm.

$4+2=6$

Consider the following tree and apply the Min-Max algorithm on the given tree. Show the path to discover the max value.



Explain why alpha beta pruning is required in Min-Max algorithm.

2

Differentiate between search states and game states.

What is cryptarithmetic problem? Trace the constraint satisfaction procedure for solving the following cryptarithmetic problem: SEND + MORE = MONEY

6

Constraints:

- I. No two different letters can be assigned the same digit.
 II. The sum of the digits must be as shown in the problem.

How does a Perceptron learn? Demonstrate how a neural network learns for the binary logic function OR.

$1+5=6$

What is a multi-layer neural network? What is a hidden layer for, and what does it hide? Derive the back-propagation algorithm for a neural network.

$2+2+4=8$

6. (a) What is NLP? Define i) Stemming ii) Lemmatization with providing appropriate example. 4
- (b) Build a parse tree with the following sentences: i) The pen is good ii) My department is computer science and engineering. 4
- (c) What is genetic programming? Show the one iteration of Genetic Algorithm where the initial population are as follows: $X_1 = 11010$, $X_2 = 01101$, $X_3 = 10100$, $X_4 = 11111$, $X_5 = 11000$ and $X_6 = 11011$. The threshold fitness ratio is given 15. Explain how does cross over work in this example. 6

7. (a) How do we evaluate multiple antecedents of fuzzy rules? Give examples. You are required to build a fuzzy inference system for the problem that takes service and food quality as inputs and computes a tip percentage using the following rules. 6
- a. If the service is poor or the food is rancid, then the tip is cheap.
 - b. If the service is good, then the tip is average.
 - c. If the service is excellent or the food is delicious, then tip is generous.

If service is 7 and food quality is 3 in the range of $[0, 10]$, calculate the tip.

- (b) Differentiate between robotic vision and computer vision. Discuss different categories of robot. 2+2 = 4
- (c) What is robotic perception? How does robot localize and track object? 1+3 = 4

8. (a) Consider the following rule

IF today is rain
THEN tomorrow is rain

How does the expert system get the overall probability of a dry or wet day tomorrow for the above rule if $P(\text{tomorrow is rain})$, $P(\text{today is rain} | \text{tomorrow is rain})$, $P(\text{today is rain} | \text{tomorrow is dry})$, $P(\text{today is dry} | \text{tomorrow is rain})$ and $P(\text{today is dry} | \text{tomorrow is dry})$ are 0.5, 0.5, 0.2, 0.2, and 0.35 respectively?

- (b) Consider the following rules

Rule1

IF Today is Strike day
THEN Today all students attend classes ($cf = 0.2$)

Rule2

IF Today is rain
THEN Today all students attend classes ($cf = 0.4$)

How does an expert system cope up with the situation when both rules are fired and what certainty will be assigned here?

- (c) What are the likelihood of sufficiency and likelihood of necessity? How does an expert determine values for LS and LN? 4

B1
manipulators
mobile robots
hybrid

$$4 \times 3 = 12$$



Jagannath University
 Department of Computer Science and Engineering
 4th Year 1st Semester Examination 2021
 Course Title: Artificial Intelligence Lab Course Code: CSE-4102

Time: 2 Hours

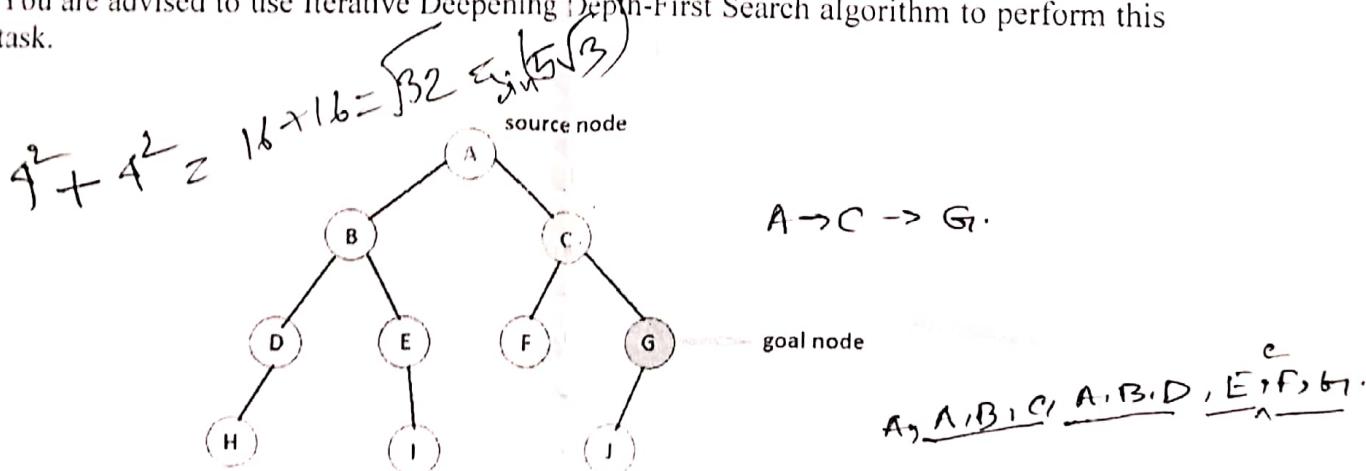
Total Marks: 20

[Attempt all the questions]

- ✓ 1. You are given two jugs, a 4-gallon one and a 3-gallon one, a pump which has unlimited water which you can use to fill the jug, and the ground on which water may be poured. Neither jug has any measuring markings on it. How can you get exactly 2 gallons of water in the 4-gallon jug? Solve the problem using Prolog. 6
2. Write a python program to implement a model that detects human face using OpenCV library. You can use two given images (test1.jpg and test2.jpg) to show that your program can correctly detect human faces from the images. 7

OR

- ✓ Write a python program to optimize the following 3D function using Genetic Algorithm. $f(x, y) = \sin(\sqrt{x^2 + y^2})$. You can limit the problem to the boundaries of $4 \geq x \geq -4$ and $4 \geq y \geq -4$. 7
- ✓ 3. Suppose you have developed a robot and the job of the robot is to find out the goal node from the following problem space. Now write a program for the robot to achieve its goal. You are advised to use Iterative Deepening Depth-First Search algorithm to perform this task. 7



Logout
Submit
Exit

Jagannath University
Department of Computer Science and Engineering
Course Code: CSE-4102
Course title: Digital Image Processing

Time: 45 minutes

Full marks: 20

MID Exam-1 (Makeup)

- | | | |
|---|---|---|
| 1 | Define the following terms:
(i) Image (ii) Resolution (iii) Pixel and (iv) Digital Image | 4 |
| 2 | Explain briefly the simple image formation model. | 4 |
| 3 | Find the number of bits required to store a 256×256 image with 32 gray levels | 2 |
| 4 | Write the general expression for the Power-Law Transformation. How Gamma correction is performed? | 4 |
| 5 | What is the main purpose of histogram equalization? Show that the histogram equalized image always have same PDF for any input image PDF. | 6 |

Jagannath University
Department of Computer Science and Engineering
Course Code: CSE-4102
Course title: Digital Image Processing

Time: 45 minutes

Full marks: 20

MID Exam-2

- 1 Define image restoration. How an arithmetic mean filter works? 4
- 2 Discuss briefly about the CMYK color model. 4
- 3 Consider the following tiny RGB image matrix where each triplet consists of Red, Green and Blue elements. Each color has 8 levels (3 bits), 0 represents absence of the color and 7 represents maximum color. Convert the tiny image into CMYK image. 4

$$\begin{vmatrix} (5,0,3) & (0,4,7) & (0,3,3) \\ (7,7,7) & (2,6,1) & (5,7,0) \\ (3,4,0) & (0,0,7) & (0,0,0) \end{vmatrix}$$

- 4 Draw and explain the general image compression system model. 3
- 5 When Huffman coding can achieve very good compression? Why? 3
- 6 What is the reason of the wider popularity of LZW coding for image compression. 2

L = Red, green
M = P + B
C = G + B

Jagannath University

Department of Computer Science and Engineering
4th Year 1st Semester Final Examination- 2021

Course title: Digital Image Processing

Course Code: CSE-4103

Time: 3 Hours

Full marks: 70

[N.B. Answer any five questions. Figures in the right margin indicate full marks. Different parts of each question must be placed sequentially]

1. (a) What is digital image processing? What are the fundamental steps involved in digital image processing? Explain. 5
- (b) What are brightness adaption and discrimination? 5
- (c) In the following arrangement of pixels, what is the value of the chessboard distance between the circled two points? 4

0	0	0	0	0
0	0	1	1	0
0	0	1	0	0
0	1	0	0	0
0	0	0	0	0
0	0	0	0	0

$f(m, n)$ \rightarrow $E_g(s_1, s_2)$
 \rightarrow $E_g(s_1, s_2)$
 \rightarrow F
 \rightarrow $K \cos(\omega t + \phi)$
 \rightarrow $K \sin(\omega t + \phi)$

Q. 2

Write the applications of Gamma and X-ray imaging.

(b) Define image restoration. How an arithmetic mean filter works? 4

(c) How many different shades of gray are there in a color RGB system in where each RGB image is an 8-bit image? 1

(d) What is the wavelength range for the electromagnetic visible spectrum? 1

(e) What do we call the total amount of energy that flows from light source? 1

(f) What are the two basic ways of expressing the electromagnetic spectrum? 2

Q. 3

(a) "Perceived brightness is not a simple function of intensity." Justify this statement with two popular visual phenomena. 6

(b) Discuss the image acquisition using a single sensor, sensor strips and sensor arrays. 6

(c) The lens of Human Eye is made up of electronic layers of what? 1

(d) What is the total amount of energy that flows from light source? 1

Q. 4

(a) What are two main types of data compression? Briefly explain. 4

(b) When Huffman coding can achieve very good compression? Why? 3

(c) With a simple example explain the LZW encoding technique. 7

0.04
0.10
0.20
0.40
0.61
1
1.25

Q. 5

(a) Explain about Spatial and Intensity resolutions. What are the units to measure them? 3

(b) Write the general expression for the Power-Law Transformation. How Gamma correction is performed? 6

5
10
15

- (c) How bit-plane slicing is done? Write the advantage(s) of bit-plane slicing.
Considering the following tiny image, derive all bit-plane sliced images.

$$\begin{vmatrix} 5 & 4 & 0 \\ 7 & 6 & 7 \\ 3 & 7 & 7 \end{vmatrix}$$

6. (a) What is point processing? Give an example. 4
 (b) Define histogram. Why is histogram equalization needed? Give the formula in terms of intensity. 4
 (c) Compare 1st and 2nd derivatives in terms of sharpening. 3
 (d) Construct the mask for Laplacian filter. The result of a Laplacian filtering is not an enhanced image in some cases, then how we can improve that? 3

- ~~7.~~ (a) Show the differences between Convolution and Correlation with a simple example. 4
 (b) After addition and/or subtraction operations on images, the pixel intensify values may exceed the gray-scale limit. Discuss an approach that guarantees the pixel values within the range still keeping the relative intensity differences. 4
 (c) Define image gradient. Write down the Roberts, Prewitt and Sobel Operators. 6

8. (a) Discuss briefly about the CMYK color model. 5
 (b) Consider the following tiny RGB image matrix where each triplet consists of Red, Green and Blue elements. Each color has 8 levels (3 bits), 0 represents absence of the color and 7 represents maximum color. Convert the tiny image into CMYK image. 5

$$\begin{array}{lll} (5,0,3) & (0,4,7) & (0,3,3) \\ (7,7,7) & (2,6,1) & (5,7,0) \\ (3,4,0) & (0,0,7) & (0,0,0) \end{array}$$

- ~~9.~~ (a) Define Hue, Saturation and Intensity. What is the necessity of HIS color model where we already have RGB and CMYK models? 3

17 - 20

Jagannath University
Department of Computer Science and Engineering
B.Sc. In CSE, 4th Year 1st Semester Final Examination 2021
Course title: Digital Image Processing Lab
Set-B
Attempt all Questions, Using a GUI is preferable

- a. Read a color image file convert it to Gray, perform the equalization.
 - b. Detect edges in an image using canny and sobel edge detection function.
2. a. Apply gaussian noise and show it's histogram. Again apply salt and peeper noise where the density noise is 0.03 and draw its histogram. Rotate an image clockwise and anticlockwise...and convert the image into a binary image and complement the binary image.
- b. Write a Matlab program to separate the RGB colour channels and show the output in Matlab GUI.
Write a Matlab program to separate the CMY color channel and show the output in Matlab GUI.

Jagannath University

Department of Computer Science and Engineering

4th Year 1st Semester Final Examination-2021

Course Title: Computer graphics and Animation

Course Code: CSE -4105

Time: 3 Hours

Marks: 70

- N.B.: (i). Answer any FIVE from the following questions
(ii). Figures in the right margin indicate marks

1. (a) What is computer graphics? Write some drives for introducing computer graphics. 1+3
(b) Define and differentiate vector and raster graphics. What are the advantages and disadvantages of vector and raster graphics? 3+2
(c) Briefly discuss about display hardware used in computer graphics. What are the common application areas of computer graphics? 3+2
2. (a) Derive the DDA algorithm from the modified line equation and explain different conditions on slope 'm'. What are the disadvantages of DDA line drawing algorithm? 4+1
(b) Calculate the intermediate points for the line with end points (20, 10) and (30, 18) using Bresenham line drawing algorithm and draw the line. 4+1
(c) What problems do arise while calculating points of a circle with polar and Cartesian form? Explain how 8-fold symmetry solves these problems. 3+1
3. (a) Derive the 2D object rotation equation with necessary diagram. 3
(b) How transformations can be reversed in homogenous coordinate system? 4
(c) Consider 3D shapes. The coordinates of the shape are A (-2, -1, -3), B (1, -1, -3), C (1, 3, 2), D (-2, 3, 2). Y-Shear is performed on the shape. After shearing, the coordinates of the shapes are A' (0, -1, 2), B' (3, -1, 2), C' (-5, 3, -13), D' (-8, 3, -13). Now find out the "shearing factor" in this transformation. 7
4. (a) What are the types of parallel projection? Discuss the advantages and disadvantages of each type of parallel projection. 5
(b) Define and classify color model. What are the differences between additive color model and subtractive color model? 5
(c) Explain the polygon filling algorithm. 4
5. (a) Define viewport. Describe the basic idea of Cohen-Sutherland clipping algorithm. 4
(b) Test the visibility and then using Cohen-Sutherland clipping algorithm perform the clipping of line whose end points are given as P1 (10, 30) and P2 (60, 10) where the window boundary is A (20, 20), B (40, 30), C (50, 40) and D (30, 30). If they are partially accepted or rejected find the line segment within the clipping window. 3
(c) Write the basic scan-fill algorithm for polygon filling. What is interior pixel convention? 7
6. (a) What is illumination and shading? Describe Phong model with its components. 4
(b) Define computer animation. What is double buffering? 1+5
(c) How to generate animations using raster operation? Describe briefly. 1+3
7. (a) Is a raster image lossless or lossy? Explain. 4
(b) When we should use JPEG file format and when not to use? 3
(c) What is compression ratio? Give an example. How does a Huffman code look like for symbols with statistical symbol occurrence probabilities: 3

$P(A) = 8/20, P(B) = 3/20, P(C) = 7/20, P(D) = 2/20?$

(d) What are the components of multimedia? Define interactive multimedia.

2+1

8. (a) What is hidden surface problem? Apply Z-Buffer surface detection algorithm on the four polygons given below and show the intermediate outputs graphically, (Consider Z-buffer range is 0 to 10 and image is of 6x6 pixel). Show all four steps separately

I. Polygon 1: Depth = 4, vertex1 = (1, 1), vertex2 = (1, 3), vertex3 = (3, 3), vertex4 = (3, 1).

II. Polygon 2: Depth = 2, vertex1 = (3, 0) vertex2 = (3, 2), vertex3 = (5, 2), vertex4 = (5, 0)

III. Polygon 3: Depth = 8, vertex1 = (2, 2); vertex2 = (2, 5), vertex3 = (4, 5), vertex4 = (4, 2)

IV. 4. Polygon 4: Depth = 0, vertex1 = (1, 3), vertex2 = (1, 5), vertex3 = (4, 5), vertex4 = (4, 3)

(b) What are the pros and cons of painter's algorithm?

4

down
front
far
back
near

Set- B

Jagannath University

Department of Computer Science and Engineering

4th Year 1st Semester Final Examination-2021

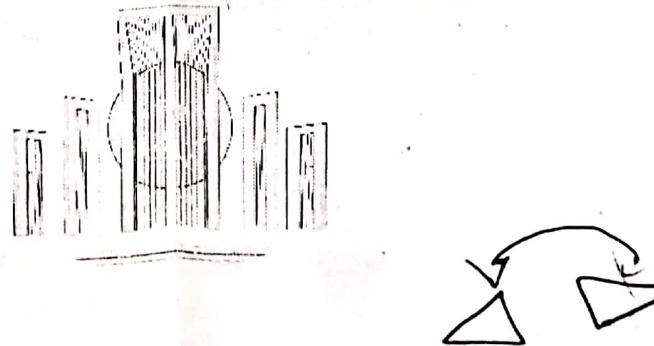
Course Title: Computer Graphics and Animation Lab

Course Code: CSEL -4106

Marks: 20

Time: 2.0 hours

1. Write a program to draw a line in OpenGL using Bresenham line drawing algorithm. 6
2. Write a program in OpenGL to draw a rotating object (choose any arbitrary object you like that rotates). 6
3. Write a program in OpenGL to draw a Martyrs' Memorial like the following image. 8



Jagannath University
Department of Computer Science and Engineering
Course Title: Data Mining and Warehousing
Course Code: CSE-4107

Marks: 20

Time: 1 hour

Illustrate if necessary.

1. (a) Consider the following table consisting of data from an employee database. Let status 7
be the class label attribute.

department	status	age	Salary
Sales	senior	28	46k...50k
Sales	junior	30	26k...30k
Systems	junior	25	46k...50k
Systems	junior	27	46k...50k
marketing	senior	39	46k...50k
marketing	junior	35	41k...45k
Systems	senior	30	46k...50k

Consider the age can be grouped into two categories- less than 30 and greater than or equal 30. Given a data tuple having the values "systems", 26 and "46...50k" for the attributes department, age, and salary, respectively, what would a naïve Bayesian classification of the status for the tuple be?

- (b) Mention some advantages and disadvantages of Naïve Bayesian classification 3
algorithm.
2. (a) Find the gini(Employee) and of the following dataset. 8

Home	Married	Gender	Employed	Credit rating	Risk
Yes	Yes	M	Yes	A	B
No	No	F	Yes	B	A
Yes	Yes	F	Yes	B	C
Yes	No	M	No	B	B
No	Yes	F	Yes	B	C
No	No	F	Yes	B	A
No	No	M	No	B	B
Yes	No	F	Yes	A	A
No	Yes	F	Yes	A	C
Yes	Yes	F	Yes	A	C

- (b) Mention some evaluating metrics for classification methods.

Jagannath University
Department of Computer Science and Engineering
CSE-4107 : Data Mining and Data Warehousing
Exam: Mid-term-2 **Time: 40 minutes**
Date: 21-04-22 (9:00-9:40 AM)

- 1(a) What is sequential pattern mining? How it is different from frequent item set mining? 3
- 1(b) Find the frequent sequence from the following table I using GSP algorithm. 7
 (min_sup=50%)

Object	Sequence
A	(1), (2), (3)
B	(1, 2), (3)
C	(1), (2, 3)
D	(1, 2, 3)
E	(1, 2), (2, 3), (1, 3)

Table I

- 2(a) Consider the following sequence database (Table II) with min_sup = 50%. Discover 7
 all frequent sequential pattern using Prefix-Span algorithm for <a>.

id	Sequence
10	<a(abc)(ac)d(cf)>
20	<(ad)c(bc)(ae)>
30	<(ef)(ab)(df)cb>
40	<eg(af)cbc>

Table II

- 2(b) State some bottlenecks of GSP and SPADE algorithm. 3

Jagannath University

Department of Computer Science and Engineering

4th Year 1st Semester Final Examination-2021

Course Title: Data Mining and Data Warehousing Course Code: CSE-4107

Time: 3 Hours

Marks: 70

- N.B.: (i). Answer any FIVE from the following questions
(ii). Figures in the right margin indicate marks

✓ 1. (a) What is data mining? State some application areas of data mining. What are the challenges of data mining? 6

(b) "Data mining discovers hidden knowledge from database", do you agree? Justify your answer. 5
are the major tasks of data preprocessing?

✓ 2. (a) What is data warehousing? What are the differences between OLTP and OLAP? 5

(b) State the name of commonly used measures of central tendency. How the Median Class is defined in group data distribution. 2

(c) Find the boxplot from the following series of data:

I. 11, 23, 32, 26, 18, 19, 30, 14, 16, 10, 12 and

II. 8, 8, 8, 8, 8, 15, 8, 10, 20.

(d) What is outlier? Rahim has got the data of runs scored by a batsman as 21, 14, 26, 8, 12, 12, 14, 26, 28, 32, and 38. Can you help Rahim to find the outlier? 3

✓ 3. (a) Find all frequent item sets with minimum support threshold value of 2 using Apriori mining algorithm for the following data. 7

TID	List of item IDs
T100	11, 12, 15
T200	12, 14
T300	12, 13
T400	11, 12, 14
T500	11, 13
T600	12, 13
T700	11, 13
T800	11, 12, 13, 15
T900	11, 12, 13

(b) We can generate 2 rules using the datasets given below.

{Diaper} → {Beer}

{Milk, Diaper} → {Bread}

TID	Items
1	Bread, Milk
2	Bread, Diaper, Beer, Eggs
3	Milk, Diaper, Beer, Coke
4	Bread, Milk, Diaper, Beer
5	Bread, Milk, Diaper, Coke

Find the support and confidence for each rule.

- 3
 (c) What are the major drawbacks of Apriori algorithm? Mention some solutions to overcome them.

- 3
 4. (a) What is sequential pattern mining? How it is different from frequent itemset mining?
 (b) Find the frequent sequence from the following table using GSP algorithm.
 (min_sup=50%).

Object	Sequence
A	(1), (2), (3)
B	(1, 2), (3)
C	(1), (2, 3)
D	(1, 2, 3)
E	(1, 2), (2, 3), (1, 3)

0-6
 $\delta = 15$
 0-4
 $\delta = 67$.

- 3
 (c) Differentiate between prediction and classification.

- 3
 5. (a) What is cluster analysis? State some application area of cluster analysis.
 (b) Suppose that a data mining task is to cluster the following six points (with (x, y) representing location). Classify the above data using Agglomerative method. Show three iterations. A1(4,6), A2(2,5), A3(3,3), A4(6,9), A5(7,5), A6(5,7)
 (c) Mention some types of Hierarchical Clustering algorithm.

- 3
 6. (a) Consider the following table consisting of data from an employee database. Let status be the class label attribute.

department	status	age	Salary
Sales	senior	28	46k...50k
Sales	junior	30	26k...30k
Systems	junior	25	46k...50k

con
con
menu

TM
PPM

Systems	junior	27	46k...50k
marketing	senior	39	46k...50k
marketing	junior	35	41k...45k
Systems	senior	30	46k...50k

Consider the age can be grouped into two categories- less than 30 and greater than or equal 30. Given a data tuple having the values "systems", 26 and "46...50k" for the attributes department, age, and salary, respectively, what would a naïve Bayesian classification of the status for the tuple be?

- (b) Mention some advantages and disadvantages of Naïve Bayesian classification algorithm. 3
- (c) Find the gini(Employee) and of the following dataset. 4

Home	Married	Gender	Employed	Credit rating	Risk
Yes	Yes	M	Yes	A	B
No	No	F	Yes	B	A
Yes	Yes	F	Yes	B	C
Yes	No	M	No	B	B
No	Yes	F	Yes	B	C
No	No	F	Yes	B	A
No	No	M	No	B	B
Yes	No	F	Yes	A	A
No	Yes	F	Yes	A	C
Yes	Yes	F	Yes	A	C

7. (a) Consider the following sequence database with min_sup = 50%. Discover all frequent sequential pattern of length 3 using Prefix-Span algorithm for $\langle a \rangle$. 8

id	Sequence
10	$\langle a(abc)(ac)d(cf) \rangle$
20	$\langle (ad)c(bc)(ae) \rangle$
30	$\langle (ef)(ab)(df)cb \rangle$
40	$\langle eg(af)cbc \rangle$

- (b) State some bottlenecks of GSP and SPADE algorithm.
 (c) Why do we need data warehouse? Explain yourself. 3
 3

8. (a) Distinguish the terms classification and clustering.
 (b) Consider the following database containing five transactions. Let min_sup = 60% 3
 8

TID	Transaction
T1	a,c,d,f,g,i,m,p
T2	a,b,c,f,l,m,o
T3	b,f,h,j,o
T4	b,c,k,p,s
T5	a,c,e,f,l,m,n,p

- (e) Mine all frequent item sets using FP growth algorithm.
 What is Multi-Dimensional Association rules? Give example.

Jagannath University

Department of Computer Science and Engineering

4th Year 1st Semester Final Examination-2022

Set-1

Course Title: Data Mining and Data Warehousing Lab
Marks: 25

Course Code: CSE-4108
Time: 2.0 hours

N.B.: (i). Answer the following from the following questions

1. Read "diabetes.csv" for diabetes datasets consist of several medical predictor variables and one target variable, Outcome. Predictor variables includes the number of pregnancies the patient has had, their BMI, insulin level, age, and so on. Experiment with the following issues with python programming language- 8

- a) Show the number of patients information using pie chart.
- b) Handle missing values using mean value for one column, median for another and mode for 3rd one if (any).
- c) Plot the boxplot of the preprocessed dataset.
- d) Compare the performance results of the ML model like LR, SVM and DT.
- e) Show the confusion matrix of your results.

2. Read petrol_consumption.csv Apply and Experiment with the following issues with python programming language: 6

- a) Predict the fuel consumption using multiple linear regression.
- b) Show and compare the results using 70:30, and 80:20 distribution during the training of the dataset.
- c) Show the actual and predicted value in a scatter plot for 80:20 distribution.
- d) Find the Mean Absolute Error.

3. Load the Mall_Customers.csv. 6

- a) Visualize male and female customer spending scores.
- b) Find ideal number of k using elbow method.
- c) Apply k-means clustering using 4 cluster and 5 cluster.
- d) Draw the graph.

4. Load the Marks.csv file. Then do the following: 5

- a) Write the statement to display the first and third quartiles of all subjects.
- b) Find the standard deviation and variance of each subject.
- c) Find the summary of the data.

Jagannath University

Department of Computer Science & Engineering

4th Year 1st Semester Mid-term Examination-2021

Batch: 9th; Session: 2017-18

Course Code: CSE-4109; Course Title: Cryptography & Information Security

Time: 40 Minutes

Full Marks: 20

Answer any TWO from the THREE questions given below. Please don't split any question.

1. a. Illustrate the general idea of asymmetric-key cryptosystem. 2
- b. Suppose Bob, the receiver of a message, chooses 7 and 11 as the two prime numbers. He also chooses $e=13$ as an intermediate value. Imagine that Alice, the sender, wants to send the plaintext 'F' to Bob. Now show the ciphertext of the message and then recover the encrypted message to the original plaintext using RSA algorithm. 5
- c. List all the attacks on RSA cryptosystem and describe any of them. 3

2. a. Suppose you have given $p = 23$ and $q = 7$ two prime numbers such that both are congruent to $3 \pmod{4}$. Let's take 24 as a plaintext. Using Rabin Cryptosystem demonstrated the encrypted and decrypted procedures for this problem. 4
- b. Demonstrate the Key generation, encryption, and decryption of ElGamal cryptosystem. 4
- c. What are the differences between public key and private key cryptosystem. 2

3. a. Using the DSS scheme, let $q = 59$, $p = 709$, and $d = 14$. Find value for e_1 and e_2 . Choose $r = 13$. Find the value of S_1 and S_2 if $h(M) = 100$. Verify the signature. 6
- b. Show the general idea of Schnorr Digital Signature Scheme. 4

Jagannath University

Department of Computer Science & Engineering
4th Year 1st Semester Mid-term Examination-2020

Batch: 9th; Session: 2017-18

Batch: X, Session: 2017-18
Course Code: CSE-4109; Course Title: Cryptography & Information Security

Time: 50 Minutes

Full Marks: 20

Answer any THREE from the TWO questions given below. Please don't split any question.

1.

 - a. Briefly explain the key information security goals. 2
 - b. What type of security mechanism(s) are provided when a person signs a form he has filled out to apply for a credit card? 1
 - c. If n is a nonnegative integer, then find the GCD of $(3n+1, 2n+1)$. 1
 - d. What is cryptanalysis? List all possible cryptanalysis attacks that can be used. 2
 - e. Using Affine cipher, decrypt the cipher text “NVERS” with the key pair $(5,3)$ 4

2.

 - a. Classify the traditional symmetric-key ciphers. 2
 - b. Encrypt the message “**the house is being sold tonight**” using Vigenere cipher with key **dollars**. 4
 - c. Using brute force attack, find the original message for the cipher text “**HTANINXFIJFIQDANWZXKTWFQQ**”. Also find the key. 4

3.

 - a. Briefly discuss the working procedures of AES algorithm. 5
 - b. What is the block size in DES? 1
 - c. What is the cipher key size in DES? 1
 - d. What is the round-key size in DES? 1
 - e. How many permutations are used in DES algorithm? 2

α	r_1	r_2	r_3
1	$2n+1$	$2n+1$	n
2	$2n+1$	n	1

34
7, 5

$$a^{n_1 n_2} \cdot \frac{5}{10} + 0$$

$\frac{a}{0}$ $\frac{b}{1}$ $\frac{c}{2}$ $\frac{d}{3}$ $\frac{e}{4}$ $\frac{f}{5}$ $\frac{g}{6}$ $\frac{h}{7}$ $\frac{i}{8}$ $\frac{j}{9}$ $\frac{k}{10}$ $\frac{l}{11}$ $\frac{m}{12}$ $\frac{n}{13}$ $\frac{o}{14}$ $\frac{p}{15}$ $\frac{q}{16}$ $\frac{r}{17}$ $\frac{s}{18}$

+ 4 5 6 7 8 9 10 11 12 13 14 15

dollars

Jagannath University
 Department of Computer Science & Engineering
 4th Year 1st Semester Final Examination-2021

Course Title: Cryptography & Information Security Course Code: CSE-4109

Time: 3.0 hours

Full Marks: 70

Answer any FIVE (05) from the EIGHT questions given below. $5 \times 14 = 70$

- ① (a) List and define the security services of computer system. 5
 (b) Use the Affine ciphers Encrypt and Decrypt the message "hello" with the key pair (7, 2). 4
 (c) State and explain passive attacks and active attacks. 5
2. (a) What is Block cipher and stream cipher, explain briefly with examples 3
 (b) List and define the security mechanisms. 4
 (c) Encrypt the message "attack is today" with Autokey cipher and decrypt it. 3
 (d) What is one time pad? One time pad offers complete security but, in practice, has two fundamental difficulties, briefly explain these difficulties. 4
3. (a) Use Hill cipher to encipher the message "corona virus". Ignore the spaces between words. Use the following key: 4

9	7	11	13
4	7	5	6
2	21	14	9
3	23	21	8

- (b) Illustrate the general design, structure of each round, and key expansion of AES algorithm. 5
 (c) Using this playfair matrix, encrypt this message: "Must see you over Cadogan West. Coming at once." 5

M	F	R	I/J	K
U	N	O	P	Q
Z	V	W	X	Y
E	L	A	R	G
B	T	S	H	C

- ④ (a) Using brute force attack on Caesar cipher find the original message and key for the ciphertext "aopztlzzhlzpzhzavljyjyfwaibaohykaavmpuikaolrlf". 5
 (b) Perform encryption and decryption using the RSA algorithm for the following: $p = 17$; $q = 31$, $e = 7$; $M = 2$, where M indicates the plaintext. 4
 (c) Show the general idea of ElGamal cryptosystem, including key generation, encryption, and decryption. 3
 (d) Differentiate between symmetric and asymmetric cryptosystem. 2

a b c d e f g h i j k l m n o p q r s t u v w x y z
 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

3 x 2 - 6

⑤ Briefly discuss the any three of the following information security attacks:

- i. Phishing
- ii. Man-in-the-Middle (MitM) Attacks
- iii. Denial-of-Service (DOS) Attack
- iv. SQL Injections
- v. Password Attack

For example, consider that $p = 7$ and $q = 11$ are the two prime numbers, and ' M ' is the plaintext. Using the Rabin cryptosystem, show the encrypted message and then decrypt the message to get the original plaintext.

List all possible attacks on the RSA algorithm, and briefly explain any of them.

⑥ Which one of the security goals is ensured by the cryptographic hash function?

Compare and contrast the features of SHA-512 and MD5 cryptographic hash function.

Broadly discuss the working principle of SHA-512 hash function.

(c) Illustrate the general concept of Whirlpool hash function.

⑦ What is entity authentication? Describe the password-based authentication techniques with example.

Show taxonomy of biometrics authentication methods.

(b) What is KDC? Explain different types of KDC.

(c) Why are the traditional symmetric ciphers much weaker than the modern ciphers?

⑧ (a) Using Rabin cryptosystem with prime numbers $p = 47$ and $q = 11$: $3 + 4 = 7$

i. Encrypt M (plain text or message) = 17 to find the C cipher text.

ii. Use the Chinese Remainder Theorem to find four possible plaintexts.

(b) Using DSS scheme, let $q = 11$, $p = 17$, and $d = 7$. Find values for e_1 and e_2 . Choose $r = 13$. Find the values of S_1 and S_2 if $h(N) = 5$. Verify the signature.

7

Logout

Set 3

Lab Final Examination-2021 (9th Batch)
CSEL-4110: Cryptography and Information Security Lab
Marks: 4×5=20

Time: 2 hours

[Solve the following problems using python/C++ programming language. Each problem carries equal marks]

✓ Given $a = 161$ and $b = 28$, find $\gcd(a, b)$ and the values of s and t using Extended Euclidian algorithm.
You have to print every step in a tabular form until you find the desired result.

2. Using the Vigenere cipher encrypt the following plaintext with the key **Russian Attack** and then get back the original message after decrypting it. You can also find the plaintext in sample input file.

Thousands of people have since died, towns and cities such as Mariupol lie in ruins and thirteen million people have been displaced. But the questions remain: what was it all for and how will it end?

3. As a trivial example of ElGamal cryptosystem, Bob chooses $p = 11$ and $e_1 = 2$ and $d = 3$. So the public keys are $(e_1, e_2, \text{ and } p)$ and the private key is d . Alice chooses a random integer 4, and plaintext 7. Now calculate the ciphertext and get back the original plaintext.

4. Alice chooses $q = 101$ and $p = 8081$. Alice selects $e_0 = 3$ and chooses $d = 61$ as the private key. Now Alice can send a message to Bob. Assume that $h(M) = 5000$ and Alice chooses random secret 61. Your task is to sign the message and then verify it using Digital Signature Standard (DSS).

$$\begin{aligned} p &= 11 \\ d &= 3 \\ e_1 &= 2 \\ e_2 &= 4 \\ q &= 101 \\ p &= 8081 \end{aligned}$$

$$a_V = 101$$

$$p = 8081$$

$$d = 61$$

$$r = 6$$

$$h(M) =$$

$$e_0 =$$

