SONARGAON UNIVERSITY (SU)

Department: Computer Science and Engineering
Program: B. Sc. in Computer Science and Engineering (CSE)
Mid-Semester Examination, Fall 2025
Year: 4th Section: Ichhamati(26M)
Course Code: CSE425
Course Title: Pattern Recognition
Name of the Course Teacher: Tasnia Haque Kheya

Time: 1 hour 30 minutes Full Marks: 30

Instructions: (i) Assume any reasonable value for missing data.
(ii) Graph paper will be supplied if required.
(iii) Marks in the right margin indicate marks of the question.

Answer any three questions out of four questions. All questions are of equal value.

1. a. **Describe** the concept of Pattern Recognition. **Write** two applications of Pattern Recognition. 3

b. From the following data, **Determine** the best fit linear regression line and **Find out** the value of Y when X = 20 7

X	5	7	9	11	13	15	17	19	21	23
Y	30	36	41	47	52	58	63	69	74	80

2. a. **Determine** the weight of ID 11 based on its height and age using the K-Nearest Neighbors (KNN) algorithm by considering the data in the following table. The predicted weight should be the average of its three nearest neighbors. 7

ID	Height	Age	Weight
1	5	45	77
2	5.11	26	47
3	5.6	30	55
4	5.9	34	59
5	4.8	40	72
6	5.8	36	60
7	5.3	19	40
8	5.8	28	60
9	5.5	23	45
10	5.6	32	58
11	5.5	38	??

b. **Discuss** the differences between Eager and Lazy Learners. 3

3. a. **Predict** whether a person will Buy Computer (Yes or No) using Naïve Bayes Classifier based on the following table, If, 8
(Age = Youth, Income = Medium, Student = Yes, Credit-Rating = Fair)

Age	Income	Student	Credit-Rating	Buy Computer
Youth	High	No	Fair	No
Youth	High	No	Excellent	No
Middle-age	High	No	Fair	Yes
Senior	Medium	No	Fair	Yes
Senior	Low	Yes	Fair	Yes
Senior	Low	Yes	Excellent	No
Middle-age	Low	Yes	Excellent	Yes
Youth	Medium	No	Fair	No
Youth	Low	Yes	Fair	Yes
Senior	Medium	Yes	Fair	Yes
Youth	Medium	Yes	Excellent	Yes
Middle-age	Medium	No	Excellent	Yes
Middle-age	High	Yes	Fair	Yes
Senior	Medium	No	Excellent	No

b. Discuss why Laplace Smoothing is used in Naïve Bayes Classifier 2

4. a. Consider the dataset in the following table. Here, the attribute values of object C are $X = Y =$ (the last three digits of your student id). 69 5

Object	Attribute 1	Attribute 2
A	10	150
B	150	10
C	X = 53	Y
D	150	150

— M1

— M2

Choose any two points as initial medoids. Now, **Determine** the total clustering cost and **Point Out** the final clusters after applying K-Medoids clustering algorithm (No of Clusters, K = 2).

b. **Analyze** why the odd values of 'K' is preferred over even values in the KNN algorithm. **Point out** the major disadvantage of K-means clustering. 3

c. "Linear Regression is prone to multicollinearity" – do you **Support** this sentence, Why or why not. 2

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Department: Computer Science and Engineering
Program: B. Sc. in Computer Science and Engineering (CSE)
Semester Final Examination, Fall 2025
Year: 4th Section: Ichhamati(26M)
Course Code: CSE425
Course Title: Pattern Recognition
Name of the Course Teacher: Tasnia Haque Kheya

Time: 2 hours Full Marks: 40

Instructions: (i) Assume any reasonable value for missing data.
(ii) Graph paper will be supplied if required.
(iii) Marks in the right margin indicate marks of the question.

Answer any four questions out of five questions. All questions are of equal value.

1. a. 3

	Predicted No	Predicted Yes
Actual No	45 TN	5
Acutal Yes	5	TP 95

TP 95
TN 45
5
5

From the above confusion matrix, **Find out** accuracy, F1-score and Recall.

b. **Differentiate** between Label Encoding and One-Hot Encoding with example(s). 3

c. **Explain** the following terms: 4

i. Bias and Variance
ii. Min-Max Normalization
iii. Cross Validation

2. Consider the following dataset with 2 dimensions: 10

x	2.5	0.5	2.2	1.9	3.1	2.3	2.0	1.0	1.5	1.1
y	2.4	0.7	2.9	2.2	3.0	2.7	1.6	1.1	1.6	0.9

Using Principal Component Analysis (PCA), reduce the dataset to one dimension. **Discuss** each step with necessary calculations.

3. a. **Write** simple examples of multi way splitting in decision tree based on: 2
(i) categorial and (ii) continuous attributes.

b. Consider the following table where "Status" represents class label. Now, **detect** the root attribute of the decision tree. 8

Department	Status	Age (years)	Salary (pounds)
sales	senior	31···35	46K...50K
sales	junior	26...30	26K···30K
sales	junior	31...35	31K...35K
systems	junior	21...25	46K...50K
systems	senior	31...35	66K...70K
systems	junior	26...30	46K···50K
systems	senior	41...45	66K ...70K
marketing	senior	36...40	46K...50K
marketing	junior	31...35	41K...45K
secretary	senior	46...50	36K...40K
secretary	junior	26...30	26K...30K

4. Consider the following training dataset, where A, B, and C are three binary attributes, and D is a binary class label. 10

Instances	A	B	C	D
1	0	0	0	0
2	0	0	1	0
3	0	1	0	1
4	0	1	1	1
5	1	0	1	1
6	1	0	1	1
7	1	1	0	0
8	1	1	0	0

Now, **build** a decision tree from this given dataset and use the build decision tree to classify two samples below:

Instances	A	B	C	D
9	1	1	1	?
10	1	0	0	?

5. a. **Interpret** the significance of ROC Curve and AUC value in model evaluation. 2

b. Let's consider, you have cluster points P1(1,3), P2(2,2), P3(5,8), P4(8,5), P5(3,9), P6(10,7), P7(3,3), P8(9,4), P9(3,7). Now, **Point Out** the final clusters after applying K-Means clustering algorithm if initial cluster centers are P7(3,3), P9(3,7), P8(9,4) and K = 3. 8

SONARGAON UNIVERSITY (SU)

Department: Computer Science and Engineering
Program: B. Sc. in Computer Science and Engineering(CSE)
Mid-Semester Examination, Fall 2025
Year: 4th Section: Icchamati(26M)
Course Code: CSE423
Course Title: Simulation and Modeling
Name of the Course Teacher: Asif Ahmed

Time: 1 hour 30 minutes Full Marks: 30

Instructions: (i) Assume any reasonable value for missing data.
(ii) Marks in the right margin indicate marks of the question.

Answer any three questions out of four questions. All questions are of equal value.

1. a. **Draw** the correlation diagram between System, Model and Simulation. 2
   b. **Contrast** between the advantages and the disadvantages of Simulation and Modeling. 5
   c. **List** some of the measures of performance statistics for a Simulation process. 3

2. a. **Differentiate** between Qualitative and Quantitative data. 2
   b. **Describe** and analyze the sequential steps in performing simulation on a model. 8

3. a. The following interarrival and service times were observed in a single-server, single-queue system: 4
   - Interarrival times (minutes): 2, 1, 3, 2, 1, 2, 1
   - Service times (minutes): 3, 4, 2, 5, 3, 4, 3

   Simulate the system over a total of 18 minutes. **Design** the simulation of the system in a tabular form.
   b. **Measure** these performance statistics from the created table: 6
      i. The average system time
      ii. Time-average number in queue

4. a. **Explain** the simulation event list and discuss the events that can occur in a simulation process. 2
   b. **Summarize** Modeling and Simulation. 3
   c. **Design** the necessary steps to develop a model and explain them. 5

SONARGAON UNIVERSITY (SU)

Department: Computer Science and Engineering
Program: B. Sc. Engineering in Computer Science and Engineering
Mid Semester Examination, Fall 2025
Year: 3rd Section: Ichhamati (26M)
Course Code: CSE 421
Course Title: Software Engineering
Name of the Course Teacher: Mohammad Naderuzzaman

Time: 1hour 30 minutes Full Marks: 30

Instruction: (i) Assume any reasonable value for missing data.
(ii) Graph paper will be supplied if required.
(iii) Marks in the right margin indicate marks of the question.

Answer any three questions out of four questions. All questions are of equal value.

1.	a.	**Write** different features of a typical software product.	2
	b.	**Define** the term software engineering. Write the reasons, why we need to implement software engineering in the software development projects.	4
	c.	**Describe** different software products available. Write the importance of implementing software engineering knowledge's.	4
2.	a.	**Identify** different application areas of software. Describe each application areas in detail. Differentiate between software development activities and umbrella activities.	5
	b.	Mention different layers of software development. Identify essential attributes of good software.	5
3.	a.	**Define** task set. Describe the reasons why we need to have task sets. Is task set different for small and big software development projects. If yes write the task sets for each.	5
	b.	**Define** software development process model. Differentiate between incremental model and V-model.	5
4.	a.	**Describe** the evolutionary models available. Identify the differences between different evolutionary models.	5
	b.	**Discuss** the personal software process model and team software process modes. Differentiate between them.	5