Roll No.:.....

National Institute of Technology Delhi

Name of the Examination: End Sem Examination (Dec. 2023)

Branch: (M.Tech. CSE(Analytics) and M.Tech. (CSE), Ph.D. (for all branches)
Title of the Course: Computational Mathematics

Time: 3 Hours

Note:1. Attempt all questions. **2.** Read all questions carefully **3.** Missing parameters or values may be assumed.

4. Z and T table can be collected from the invigilators on sharing basis.

Semester: I
Course Code: CSLM 501
Maximum Marks: 50

Q.No.	1	2	3	4	5	6
C.O.	CO1	CO2	CO2	CO3	CO3	CO4
P.O.	1	2	2	3	3	4
B.L.	1	3	2	2	3	3

1. (a) If X and Y are independent, then prove that $Cov(X, Y) = 0$. (3)

   (b) Proof the Chebyshev's inequality. (5)
   Suppose that it is known that the number of items produced in a factory during a week is a random variable with mean 50. What can be said about the probability that this week's production will exceed 75? If the variance of a week's production is known to equal 25, then what can be said about the probability that this week's production will be between 40 and 60?

   (c) Calculate the variance of Geometric Random Variable. (3)

2. (a) How large the random sample need be to meet certain specifications concerning type II errors. Generate the expression. For instance, suppose that we desire to determine the sample size n necessary to ensure that the probability of accepting $H_0 : \mu = \mu_0$ when the true mean is actually μ_1 is approximately β. (3)

   (b) If $X_1, X_2, ..., X_n$ is a sample from a normal population whose mean μ is unkown but whose variance σ^2 is known, show that $(-\infty, \bar{X} + z_\alpha \sigma/\sqrt{n})$ is a $100(1-\alpha)$ percent lower confidence interval for μ. (3)

3. (a) Suppose that when a signal having value μ is transmitted from location A the value received at location B is normally distributed with mean μ and variance 4. That is, if μ is sent, then the value received is $\mu + N$ where N , representing noise, is normal with mean 0 and variance 4. To reduce error, suppose the same value is sent 9 times. If the successive values received are 5, 8.5, 12, 15, 7, 9, 7.5, 6.5, 10.5, let us construct a 95 percent confidence interval for μ. (4)

   (b) An astronomer wants to measure the distance from her observatory to a distant star. However, due to atmospheric disturbances, any measurement will not yield the exact distance d. As a result, the astronomer has decided to make a series of measurements (3)

and then use their average value as an estimate of the actual distance. If the astronomer believes that the values of the successive measurements are independent random variables with a mean of d light years and a standard deviation of 2 light years, how many measurements need she make to be at least 95 percent certain that her estimate is accurate to within ± 0.5 light years?

4. (a) Civil engineers believe that W, the amount of weight (in units of 1,000 pounds) that a certain span of a bridge can withstand without structural damage resulting, is normally distributed with mean 400 and standard deviation 40. Suppose that the weight (again, in units of 1,000 pounds) of a car is a random variable with mean 3 and standard deviation .3. How many cars would have to be on the bridge span for the probability of structural damage to exceed 0.1? (4)

   (b) Prove that, "with 95 percent confidence" we assert that the true mean lies within $1.96\sigma/\sqrt{n}$ of the observed sample mean. The interval $(\bar{x} - 1.96\frac{\sigma}{\sqrt{n}}, \bar{x} + 1.96\frac{\sigma}{\sqrt{n}})$ is called a 95 percent confidence interval estimate of μ. (4)

5. (a) Suppose that when a signal having value μ is transmitted from location A the value received at location B is normally distributed with mean μ and variance 4. That is, if μ is sent, then the value received is $\mu + N$ where N , representing noise, is normal with mean 0 and variance 4. To reduce error, suppose the same value is sent 9 times. If the successive values received are 5, 8.5, 12, 15, 7, 9, 7.5, 6.5, 10.5, let us construct a 95 percent confidence interval for μ. (4)

   (b) Use the data of above Problem (5 a) to obtain a 99 percent confidence interval estimate of μ, along with 99 percent one-sided upper and lower intervals. (4)

   (c) Let us again again consider above Problem (5 a) but let us now suppose that when the value μ is transmitted at location A then the value received at location B is normal with mean μ and variance σ^2 but with σ^2 being unknown. If 9 successive values are, as in above Example, 5, 8.5, 12, 15, 7, 9, 7.5, 6.5, 10.5, compute a 95 percent confidence interval for μ. (4)

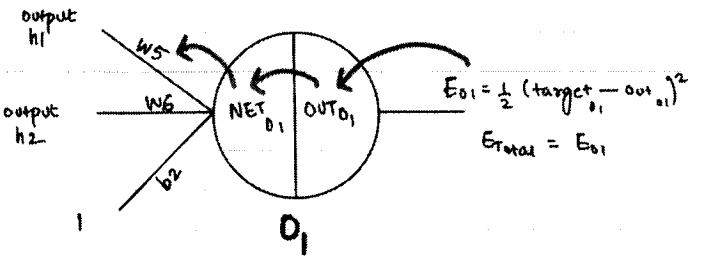
6. (a) A public health official claims that the mean home water use is 350 gallons a day. To verify this claim, a study of 20 randomly selected homes was instigated with the result that the average daily water uses of these 20 homes were as follows: (4)

   340 344 362 375
   356 386 354 364
   332 402 340 355
   362 322 372 324
   318 360 338 370

   (b) Do the data contradict the official's claim? Explain Type I and Type II error (2)

National Institute of Technology, Delhi
Name of the Examination: End-Semester Examination
(Autumn Semester 2023)

Branch: CSE(Ph.D/M.Tech) **Semester: I**
Title of the Course: Motion analytics **Course Code: CSBM 616**
Time: 3 hours **Maximum Marks: 50**

Q.no	Question	Marks	CO	BL	PO
	~~Section I: Each question carries 1 mark~~				
1	Discuss the Gait Parameters included in Human Gait Analysis. Explain how the variations of these parameters occur in contrast with joint anatomy and the biomechanics of movements.	5	1,3	1	1
2.	Compare the Artificial Neuron with biological neuron. Consider a neuron from the backpropagation neural network as following.  let h_1= 0.593 h_2= 0.597, b_2=0.6, W_5=0.4, W_6=0.45 and Target O_1 =0.01. Derive and find the partial derivative of E_{Total} with respect to W_5 i.e ($\frac{\partial E_{Total}}{\partial w_5}$) for the above figure .	10	1	2	1
3.	a) What is an Electrogoniometer and a Potentiometer. b) Explain how integrating signals from multiple modalities, such as vision-based and sensor-based signals, could result in better accuracy and reliability of automated gait analysis systems. c) How can signal processing techniques fuse this information from different modalities?	10	2,3	2	1,2
4.	Explain the limitations and challenges associated with marker-less motion capture methods in the context of human gait analysis.	10	2	3	2

5.	Suppose, as a computer scientist, you have been assigned to distinguish between four walking disability. Limping Gait: Characterized by an uneven and irregular walking pattern, often associated with pain or discomfort in one leg. Toe-Walking Gait: Involves walking on the toes rather than the entire foot, typically seen in neurological conditions or muscle imbalances. Wide-Based Gait: Exhibits an abnormally wide stance during walking, which may indicate balance or coordination issues. Shuffling Gait: Involves short steps with minimal foot lift, often associated with Parkinson's disease. You have been given pressure data from pressure plates of individual walks over a 3m platform. Your task is to develop a machine learning model to classify individuals into four distinct gait abnormalities. What will be your approach.	10	1	4	1
6.	Explain the role of advanced signal processing tools in improving the accuracy and depth of motion insights. Discuss the following tools with an example: a. wavelet transforms b. time-frequency analysis c. machine learning-based signal processing	5	2	3,5	1

Roll No.:.....

National Institute of Technology, Delhi

Name of the Examination: M. Tech & PhD

Branch : CSE **Semester :I**

Title of the Course :Machine Learning **Course Code : CSLM (611)**

Time: 3 Hours **Maximum Marks: 50**

Note: Please attempt all questions

Marks	Q. (1)	Q. (2)	Q. (3)	Q. (4)	Q. (5)	Q. (6)	Q. (7)
CO	CO3	CO3	CO4	CO4	CO4	CO4	CO4
BL	L2	L3	L3	L3	L4	L4	L4

1. Explain the concept of SVM and its use in both classification and regression problems. Describe the kernel trick and its significance in SVM.

(5 Marks)

2. Explain in detail the machine learning process model.

(5 Marks)

3. Explain the FOIL algorithm in the context of decision trees. Compare and contrast it with the CART algorithm, highlighting their respective strengths and weaknesses.

(5 Marks)

4. Let us assume a regression algorithm generates a model y=0.54+0.66x for data pertaining to week sales data of a product. Here, x is the week and y is the product sales. Find the prediction for the 5^{th} and 8^{th} week.

(5 Marks)

5. If a dataset containing information about house prices with the following columns: 'area', 'bedrooms', 'bathrooms', 'price'. Perform EDA and answer the following:

   - Calculate the mean, median, and standard deviation for the 'price' column.
   - Visualize the relationship between 'area' and 'price' using a scatter plot.
   - Determine the correlation between 'bedrooms' and 'bathrooms'.

(6 Marks)

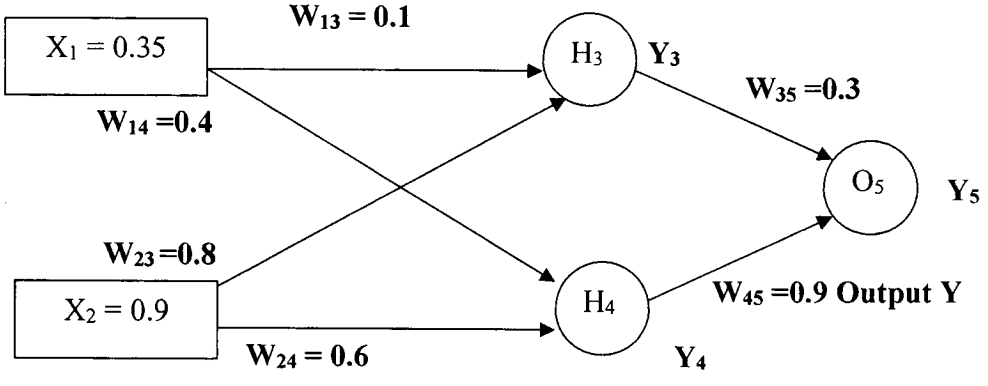
6. Consider the training dataset in given Table. Construct decision trees using ID3, C4.5, and CART.

S.NO	Assessment	Assignment	Project	Seminar	Result
1.	Good	Yes	Yes	Good	Pass
2.	Average	Yes	No	Poor	Fail
3.	Good	No	Yes	Good	Pass
4.	Poor	No	No	Poor	Fail

5.	**Good**	**Yes**	**Yes**	**Good**	**Pass**
6.	**Average**	**No**	**Yes**	**Good**	**Pass**
7.	**Good**	**No**	**No**	**Fair**	**Pass**
8.	**Poor**	**Yes**	**Yes**	**Good**	**Fail**
9.	**Average**	**No**	**No**	**Poor**	**Fail**
10.	**Good**	**Yes**	**Yes**	**Fair**	**Pass**

(7 Marks)

7. Assume that the neurons have a sigmoid activation function, perform a forward pass and backward pass on the network. Assume that the actual output of y is 0.5and learning rate is 1. Perform another forward pass.



(7 Marks)

Roll No.:.....

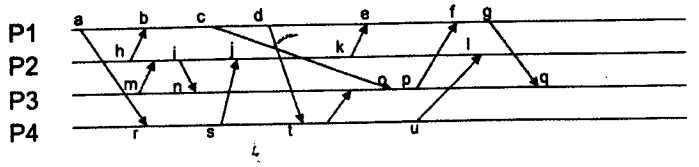
National Institute of Technology, Delhi

End Semester Examination (Autumn Semester 2023)

Branch	**: CSA**	**Maximum Marks**	**: 50**
Semester	**: 1st**	**Time**	**: 03 Hours**
Title of the Course	**: Distributed Databases**	**Course Code**	**: CSBM 662**

Note: Read all questions carefully. Draw diagrams wherever necessary.

Q. No	Questions	Marks	CO	BL	PO
1. (a)	List various issues that need to be considered during query optimization.	3	2	L2, L3	1
(b)	What do the C and A in the CAP theorem stand for? Give an example of how designing for one of those properties can lead to difficulties in maintaining the other.	3	4	L2, L3	6
(c)	Elaborate on how vertical scalability differs than horizontal scalability. Give different database products/software adhering to these.	3	1	L1, L2	7
(d)	You are assigned the task of building a database to model employees and whom they work with in your company. The database must be able to answer queries such as how many employees does Employee A work with? And does Employee A work with anyone who works with Employee B? Explain which type of NoSQL database would naturally fit with these requirements.	3	4	L2, L3	4
2.	**Consider the following database schema:** emp(name,age,sal,dno) dept(dno, dname, floor, budget, mgr, ano) acnt(ano, type, balance, bno) bank(bno, bname, address) **Consider the following queries:** (a) select name, floor from emp, dept where emp.dno = dept.dno and sal>100K and floor= 1 or floor=2; Transform the query into normal form (conjunctive and disjunctive) (b)select name, floor from emp, dept where emp.dno = dept.dno and sal>100K Generate all possible query trees for the given query. (c) select name, floor, balance from emp, dept, acnt where emp.dno = dept.dno and dept.ano = acnt.ano Show all the possible join trees for the given query.	8	2	L2, L3	2
3.	Consider the figure below that shows four processes (P1, P2, P3, P4) with events a,b,c,.....and messages communicating between them.	08	3	L2, L5	3

	Assume that the initial logical clock values are all initialized to 0. **(a)** List the Lamport timestamps for each event shown in Figure below. Assume that each process maintains a logical clock a single integer value as a Lamport clock. Provide timestamps for each labeled event.  **(b)** Is there a potential for a casual violation? Explain why. **(c)** Identify the Concurrent Events.				
4.	**(a)** Explain INGRES algorithm. **(b)** Consider the following relational tables EMP, ASG, PROJ, and PAY: EMP ENO | ENAME | TITLE E1 | J. Doe | Elect. Eng E2 | M. Smith | Syst. Anal. E3 | A. Lee | Mech. Eng. E4 | J. Miller | Programmer E5 | B. Casey | Syst. Anal. E6 | L. Chu | Elect. Eng. E7 | R. Davis | Mech. Eng. E8 | J. Jones | Syst. Anal. ASG ENO | PNO | RESP | DUR E1 | P1 | Manager | 12 E2 | P1 | Analyst | 24 E2 | P2 | Analyst | 6 E3 | P3 | Consultant | 10 E3 | P4 | Engineer | 48 E4 | P2 | Programmer | 18 E5 | P2 | Manager | 24 E6 | P4 | Manager | 48 E7 | P3 | Engineer | 36 E8 | P3 | Manager | 40 PROJ PNO | PNAME | BUDGET | LOC P1 | Instrumentation | 150000 | Montreal P2 | Database Develop. | 135000 | New York P3 | CAD/CAM | 250000 | New York P4 | Maintenance | 310000 | Paris PAY TITLE | SAL Elect. Eng. | 40000 Syst. Anal. | 34000 Mech. Eng. | 27000 Programmer | 24000 **Consider the query q1: "Names of employees working on the CAD/CAM project."** **q1:** SELECT EMP.ENAME FROM EMP, ASG, PROJ WHERE EMP.ENO = ASG.ENO AND ASG.PNO = PROJ.PNO AND PROJ.PNAME =" CAD/CAM" Apply INGRES Algorithm to the above query q1. **(c)** Explain how centralized INGRES algorithm is different from the distributed INGRES algorithm?	10	2	L2, L3	5,10
5.	**(a)** What are the different types of distributed reliability protocols? **(b)** Explain Two-Phase Commit protocol (2PC) and disadvantages of 2PC. **(c)** Explain Distributed Three-Phase Commit protocol. **(d)** Elaborate through example various types of NoSQL stores.	12	3	L4, L5	8,9

Roll No .....

National Institute of Technology, Delhi

M Tech (CSE)

CSBM505 Data Mining

End Semester Examination, 2023

Duration: 03 Hours Max. Marks: 50 Date: 13 December, 2023

Note: Attempt all the questions.

<table>
<tr><th></th><th>Questions</th><th>Marks</th><th>CO</th><th>BL</th></tr>
<tr><td>1.</td><td>a. A transaction data of a restaurant is given in the table below to show 6 orders. The orders are having 5 food items which are burger, pizza, ketchup, cold drink, and french fries.
<table>
<tr><td>Order Id</td><td>List of items</td></tr>
<tr><td>Order1</td><td>Burger, pizza, ketchup</td></tr>
<tr><td>Order2</td><td>Burger, pizza</td></tr>
<tr><td>Order3</td><td>Burger, Cold drink, French fries</td></tr>
<tr><td>Order4</td><td>French fries, Cold drink</td></tr>
<tr><td>Order5</td><td>French fries, Ketchup</td></tr>
<tr><td>Order6</td><td>Burger, Cold drink, French fries</td></tr>
</table>
By using the above dataset build a FP tree with support 33%. Show the constructed tree at every step.
Discuss the importance of cross-validation in evaluating data mining models.</td><td>5</td><td>2</td><td>3</td></tr>
<tr><td></td><td>b. By using the above dataset build a FP-tree with support 33%. Show the constructed tree at every step.
<table>
<tr><td></td><td>hot dogs</td><td>hotdogs</td><td>$\sum_{row}$</td></tr>
<tr><td>hamburgers</td><td>2000</td><td>500</td><td>2500</td></tr>
<tr><td>hamburgers</td><td>1000</td><td>1500</td><td>2500</td></tr>
<tr><td>$\sum_{col}$</td><td>3000</td><td>2000</td><td>5000</td></tr>
</table>
The above contingency table summarizes supermarket transaction data, where hot dogs refers to the transactions containing hot dogs, hotdogs refers to the transactions that do not contain hot dogs, hamburgers refers to the transactions containing hamburgers, and hamburgers refers to the transactions that do not contain hamburgers.
i. Suppose that the association rule "hot dogs => hamburgers" is mined. Given a minimum support threshold of 25 % and a minimum confidence threshold of 50 %, is this association rule strong?
ii. Based on the given data, is the purchase of hot dogs independent of the purchase of hamburgers? If not, what kind of correlation relationship exists between the two?</td><td>5</td><td>3</td><td>3,4</td></tr>
<tr><td>2</td><td>a Consider the training examples shown in following table for a binary classification problem.</td><td>5</td><td>3</td><td>3</td></tr>
</table>

Instance	a_1	a_2	a_3	Target Class
1	T	T	1.0	+
2	T	T	6.0	+
3	T	F	5.0	−
4	F	F	4.0	+
5	F	T	7.0	−
6	F	T	3.0	−
7	F	F	8.0	−
8	T	F	7.0	+
9	F	T	5.0	−

i. What is the entropy of this collection of training examples with respect to the positive class?

ii. What are the information gains of a_1 and a_2 relative to these training examples?

iii. For a_3, which is a continuous attribute, compute the information gain for every possible split.

iv. What is the best split (between a_1 and a_2) according to the classification error rate?

v. What is the best split (between a_1 and a_2) according to the Gini index?

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2 | b Consider the points with x and y coordinates in the table given below: | 5 | 2 | 3

	x	y
1	2.0	2.0
2	2.5	3.0
3	4.0	5.0
4	6.0	8.0
5	4.5	6.0
6	5.5	6.0
7	4.5	5.5

Apply K-Means clustering to generate clusters by choosing points 1 and 4 as initial center points. By using Euclidean distance compute dissimilarity among points. Show the clusters and intermediate center coordinates for two iterations.

---

3 | a | 5 | 2,3 | 4

	1	**2**	**3**	**4**	**5**	**6**
1	0					
2	9	0				
3	3	7	0			
4	6	5	9	0		
5	11	10	2	8	0	
6	5	3	1	4	2	0

i. Perform agglomerative Clustering and generate the Dendrogram for the above given data.

ii. Demonstrate the output after each step

iii. Differentiate between single and complete Linkage clusters

---

3 | b | 5 | 2 | 2

i. How do you improve the efficiency of Apriori -based mining using Hash based Techniques

ii. Why is tree pruning useful in decision tree induction? What is the drawback of using a separate set of tuples to evaluate pruning?

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4 | i. Explain the concept of over fitting in the context of machine learning models. | 2 | 2 | 2

ii. Discuss strategies for handling data quality and consistency issues during the integration process. | 2 | 1 | 2

	iii. Describe the multidimensional model and its components in the context of data cubes.	2	1	2
	iv. Explain the concept of dimensions, hierarchies, and measures in a multidimensional model.	2	1	2
	v. Consider a set of transactions: a. Transaction 1: {A, B, C} b. Transaction 2: {B, C, D} c. Transaction 3: {A, C, D, E} d. Transaction 4: {A, D, E} e. Transaction 5: {B, C, E} Apply the Hunt algorithm to find frequent item sets with a minimum support count of 2.	2	2	3
5	a Dataset: [[1.0, 2.5, 3.2, 1.8], [3.0, 4.0, 5.0, 2.5], [1.8, 2.5, 3.0, 1.0], [4.0, 3.0, 4.5, 2.2], [3.2, 3.8, 4.0, 1.5], [2.5, 3.0, 3.5, 1.2], [4.0, 4.2, 4.8, 2.8], [3.8, 4.0, 4.2, 2.0], [2.9, 3.2, 3.8, 1.5], [4.5, 5.2, 5.5, 3.0]] i. Perform principal component analysis (PCA) on a dataset and identify the principal components. ii. Discuss the variance explained by each principal component.	5	3	4
.	b Draw Regression tree for the following	5	3	4

Predictors | Target

Outlook	Temp	Humidity	Windy	Hours Played
Rainy	Hot	High	False	26
Rainy	Hot	High	True	30
Overcast	Hot	High	False	48
Sunny	Mild	High	False	46
Sunny	Cool	Normal	False	62
Sunny	Cool	Normal	True	23
Overcast	Cool	Normal	True	43
Rainy	Mild	High	False	36
Rainy	Cool	Normal	False	38
Sunny	Mild	Normal	False	48
Rainy	Mild	Normal	True	48
Overcast	Mild	High	True	62
Overcast	Hot	Normal	False	44
Sunny	Mild	High	True	30

National Institute of Technology, Delhi

Name of the Examination: M.Tech First Year (AY 2023-2024)

End Semester Examination

Branch :CSE/CSA **Semester** : I

Title of the Course :Advanced Data Structure and Algorithms

Course Code :CSBM502

Time: 3 Hours **Maximum Marks: 50**

Note: Attempt ANY TEN questions. (5 Marks each)

Que No	Question	MARKS	CO	PO	BL
1	Suppose we are comparing implementation of insertion sort and merge sort on the same machine. For inputs of size n, insertion sort runs in $8n^2$ steps, while merge sort runs in 64 nlgn steps. For which value of n does insertion sort beat merge sort?	5	1	2	3
2	The recurrence $T(n)=7T(n/2)+n^2$ describes the running time of an algorithm A. A competing algorithm A' has a running time of $T'(n)=aT(n/4)+n^2$. What is the largest integer value of a such that A' is asymptotically faster than A?	5	2	1	1
3	What is Longest Common subsequence problem? Propose a recursive solution to this problem. Determine an LCS of {1, 0, 0, 1, 0, 1, 0,1} and {0, 1, 0,1, 1, 0, 1, 1, 0}	5	3	1	2
4	A sequence of n operations is performed on a data structure. The ith operation costs I if I is an exact power of 2 and 1 otherwise. Use aggregate analysis to determine the amortized cost per operation.	5	1	2	2
5	Write recursive and non recursive version of disjoint set forest with union by rank and path compression algorithm. Analyse the complexity of both the algorithms.	5	3	1	2
6	State the maximum flow problem as a linear programming problem.	5	2	2	2
7	Give an example of a linear program for which the feasible region is not bounded, but the optimal objective value is finite.	5	3	2	3
8	Formulate the simplex method. Analyze the complexity.	5	1	1	1

9	Explain the point value representation of a polynomial. Write algorithm for fast multiplication of polynomials.	5	1	3	1
10	Working modulo q=11, how many spurious hits does the Robin-Karp matcher encounter in the text T=3141592653589793 when looking for the pattern P=26?	5	2	2	2
11	Give an algorithm that finds an optimal vertex cover for a tree in linear time.	5	3	1	2
12	What do you understand by randomized algorithm? Give a randomized version of quicksort. Analyse the complexity.	5	3	1	1
13	What is NP-Completeness? Explain the difference between polynomial time and non polynomial time algoritms? Explain any one algorithm of each form.	5	3	3	3

राष्ट्रीय प्रौद्योगिकी संस्थान दिल्ली

NATIONAL INSTITUTE OF TECHNOLOGY DELHI

(शिक्षामंत्रालय, भारत सरकार के अधीन एक स्वायत्त संस्थान)

(An autonomous Institute under the aegis of Ministry of Education (Shiksha Mantralaya), Govt. of India)

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Autumn Semester AY 2023-24

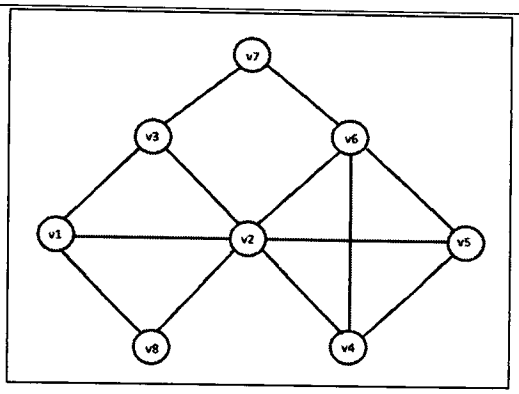
Department of Computer Science and Engineering

End Semester Examination

December 15, 2023 (02:00 – 05:00 PM)

Degree	M. Tech.	**Branch**	CSE
Semester	I		
Subject Code & Name	CSLM 624 – Social Network Analysis		
Time: 180 Minutes	**Answer All Questions**		**Maximum: 50 Marks**

Sl. No.	Question	Marks	KL	CO
1.a	What is the significance of *Local Clustering Coefficient* for a node in a social network. Explain with an example	2 (1+1)	L1	CO3
1.b	Apply your understanding of *Online Social Networks*' basic functionalities to illustrate the scenario that comprises of *Asymmetric Relations* between different social actors. You may take example of any popular online social media platform to explain above-mentioned relationship.	3	L3	CO3
1.c	Suppose, in a particular geographic region, there's requirement to analyze the growth of a social community and it may be recorded based on temporal analysis. Analyze this scenario to put some light on *Temporal Network Analysis*.	5	L4	CO3
2.a	Explain the concept of *Triplets* in a Social Network. How do they help in exploring useful insights in a social network.	2	L2	CO4
2.b	Give your opinion about the utility of *Average Path Length* in Social Network Analysis. How is it related to Small Worl Property?	3 (1+2)	L5	CO4
2.c	Explain Milgram's *Small-World* experiment and demonstrate how is it relevant in the domain of Social Network Analysis.	5	L3	CO4
3.a	What are the *Disjoint Communities* in Social Networks? Explain the strictest approach to detect disjoint communities in a Social Network.	2 (1+1)	L1	CO5
3.b	Identify the *Machine Learning Pipeline* required to analyze the social networks. Also, identify the criterion required for *Graph Representation Learning*.	3 (2+1)	L3	CO5
3.c	Examine the given network, as shown in the Fig. 1 to identify the *Overlapping Communities*, using *Clique Percolation* and determine the optimal value of *k*.	5 (3+2)	L4	CO5

	 Fig. 1: Network Graph for Q. No. 3.c			
4.a	Explain the significance of *Social Network*-based analysis in today's marketing strategies.	2	L2	CO1
4.b	What are the *Social Actors* and *Dyadic*? Explain with a well-framed example.	3 (1+1+1)	L2	CO1
4.c	Analyze the statement "*Pseudo Graphs suit best in depicting a particular behavior*" in the context of Social Network Analysis.	5	L4	CO1
5.a	Derive, a function for a *Signed Network* that may sense emotions of posts on an *Online Social Network* and explain its application scenario.	2 (1+1)	L3	CO2
5.b	Design and develop a conceptual application that utilizes *Graph Degrees* to explore useful insights in a Social Network. A detailed discussion along with an illustration is required.	3	L6	CO2
5.c	Analyze the following statement in context of a Heterogenous Network: "*Each node belongs to a particular type*" A proper explanation with illustration is required.	5	L4	CO2

*******Good Luck*******