SOMAIYA VIDYAVIHAR UNIVERSITY

Maximum Marks: 30	**Semester: January 2023- May 2023** **Examination: In-Semester Examination**	**Duration :1hr& 15 min**
Programme code: 04 **Programme:** B.Tech.	**Class:** SY	**Semester:** IV **(SVU 2020)**
Name of the Constituent College: **K. J. Somaiya College of Engineering**		**Name of the department:** IT
Course Code: 116U04C401	**Name of the Course:** Probability, Statistics and Optimization Techniques	

Question No.		Max. Marks
Q1	**Attempt any two**	**10**
A	A random sample of recent repair jobs was selected and estimated cost and actual cost were recorded. Calculate the value of spearman's correlation coefficient Estimated Cost: 300, 450, 800, 250, 500, 975, 475, 400 Actual Cost: 273, 486, 734, 297, 631, 872, 396, 457	**5**
B	It is given that the mean x and y are 5 and 10. If the line of regression of y on x is parallel to the line $20y = 9x + 40$. Estimate the value of y for $x = 30$.	**5**
C	Determine the Karl Pearson's coefficient of correlation from the following x: 68, 64, 75, 50, 64, 80, 75, 40, 55, 64 y: 62, 58, 68, 45, 81, 60, 68, 48, 50, 70	**5**
Q2	A random variable x has the following probability function X: 1, 2, 3, 4, 5, 6, 7 P(x): k, 2k, 3k, k^2, k^2+k, $2k^2$, $4k^2$ Find i) k ii) P(x<5) iii) P(x>5) iv) P((2<x<6)/x<5) v) mean vi) variance	**10**
	OR	
	A box contains 3 coins, first coin is fair, second coin is two headed, third coin is weighted so that the probability of a head appearing is 1/3 . A coin is selected at random from the box and tossed (i) find the probability that head appears (ii) If head appears what is probability that it comes on first coin? (iii) If head appears what is probability that it comes on second coin?	**10**
Q3	Distinguish between Null hypothesis and Alternate hypothesis. Average height of a sample of 6400 persons from one population was found to be 67.85 inches with a S.D of 2.56 inches. Average height of a sample of 1600 persons from another population was found to be 68 inches with a S.D of 2.52 inches. Is the difference between the mean heights of two samples significant?	**10**

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Maximum Marks: 30	Semester: January 2023- May 2023 Examination: In-Semester Examination	Duration :1hr15mins
Programme code: 04 Programme: BTech-IT	Class: SY	Semester: IV (SVU2020)
Name of the Constituent College: K. J. Somaiya College of Engineering	Name of the department: IT	
Course Code: 116U04C402	Name of the Course: Information Technology and Coding	

Q No		Max. Marks
Q1	**ANSWER ANY FOUR:-**	
(a)	Define Self Information. If the self-information of a symbol or an event X is zero, what does it mean?	03
(b)	Define Mutual Information and write its properties	03
(c)	Explain briefly the concept of a Noiseless Channel. Give an example of a typical channel matrix for a noiseless channel.	03
(d)	Explain the term Instantaneous code or Uniquely decodable code.	03
(e)	Complete the sentence with right option. In a Binary symmetric channel:- i. p(x1) = p(x2) ii. p(y1) = p(y2) iii. Error probability is the same for both symbols	03
(f)	iv. All of the above Choose the right sequence:- i. Data Compression, Modulation, Multiplexing, Channel coding ii. Source coding, Channel coding, Modulation, Multiplexing iii. Modulation, Channel coding, Multiplexing, Source coding	03
Q2		
(a)	Encode the string "MAKERMELA" using the Shannon-Fano coding algorithm. Check whether the resulting code satisfies Kraft's Inequality Theorem. **----- OR ------** Use the string "FUNNY" to explain the process of Arithmetic coding.	06
(b)	Use the LZW method to encode the string "pppqqpqpqqqppppp". Show all steps clearly. Also calculate the code efficiency (compression ratio).	06
Q3	A DMS has the symbol set S = { x1, x2, x3} where **p(x1)=p(x2)=p(x3)=1/3.** The conditional probability matrix is given below: P[Y|X] = x1 | 1 0 0 | x2 | 0 1 0 | x3 | 0 0 1 | (columns y1 y2 y3) Calculate the Joint Entropy H(X, Y).	06

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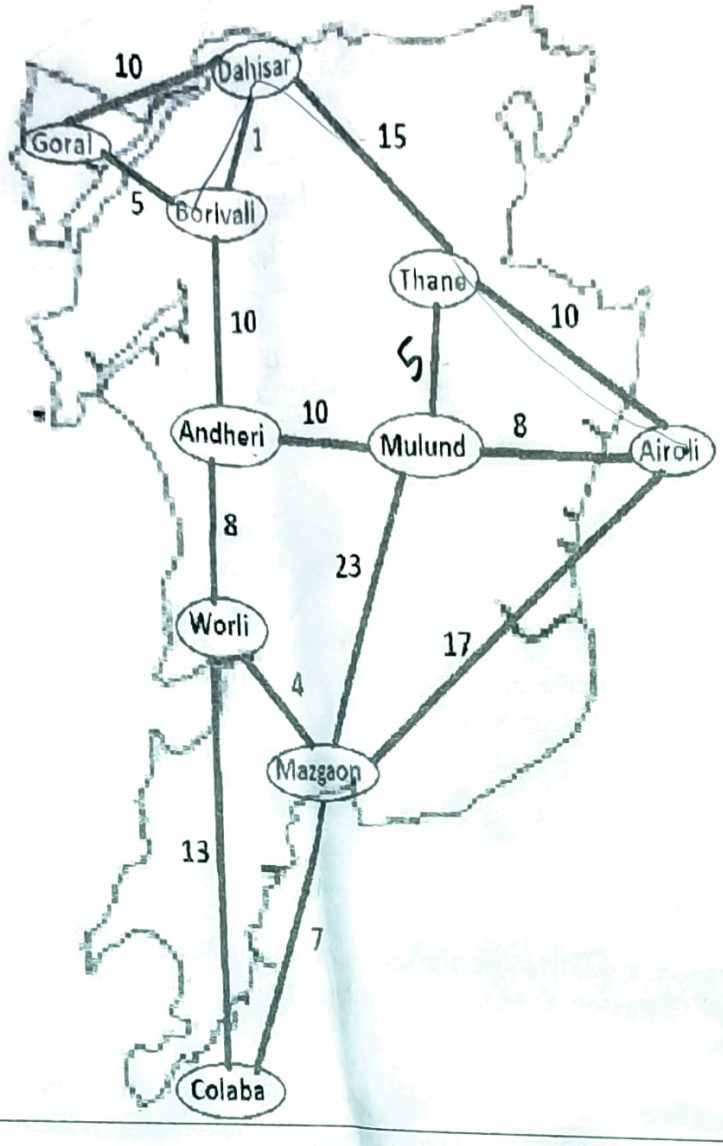
Semester: January 2023 – May 2023			
Maximum Marks: 30 M	Examination: In-Semester Examination		Duration :1hr:15 Min
Programme code: 04 **Programme: B. Tech Information Technology**		**Class:** SY	**Semester:** IV(SVU 2020)
Name of the Constituent College: **K. J. Somaiya College of Engineering**		**Name of the department:** IT	
Course Code: 116U04C403	**Name of the Course: Analysis of Algorithms**		

Question No.		Max. Marks
Q1	Simplify using recursion tree and determine a good asymptotic upper bound on the recurrence T(n)=T(n/5)+T(4n/5)+cn and prove the same using substitution method. **OR** Write the Algorithm/pseudocode for Heap Sort Algorithm and also derive the Time complexity of Heap Sort.	10
Q2	Multiply the following matrices $\begin{pmatrix} 1 & 3 \\ 7 & 5 \end{pmatrix} \times \begin{pmatrix} 6 & 5 \\ 4 & 8 \end{pmatrix}$ Using Strassen's Matrix Multiplication method. Write down the recurrence relation of Strassen's Matrix Multiplication method and find the time complexity. **OR** Derive the Time complexity of Quick Sort using Master Theorem. Sort the following list of elements in ascending order using Quick sort technique. Give the output of each step. **(Consider first element as Pivot)** {25, 29, 13, 67, 79, 33, 51, 1}	10
Q3	**Consider the following Scenario :-** Online shopping Site **Amaze.com** has come up with innovative Idea to deliver the product door to door in Mumbai with the help of Automated Drone. The Drone is Loaded & programmed with Shortest path algorithm for the below Mumbai 10 locations. Considering the above Use case Drone has to deliver Product from Source to destination by considering shortest path to be travelled. If Drone is currently at **"Gorai"** location and it has to deliver the product to **"Airoli"** location find the shortest route and shortest destination it will take using Dijkstra Algorithm.	10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Maximum Marks: 30	Semester: January 2023- May 2023 Examination: In-Semester Examination	Duration : 1Hr. 15 Min
Programme code: 04 Programme: B.Tech	Class: SY	Semester: IV (SVU 2020)
Name of the Constituent College: K. J. Somaiya College of Engineering	Name of the department: IT	
Course Code: 116U04C404	Name of the Course: Advanced Databases	

Question No.		Max. Marks
Q.1	Consider the following database with 4 records that has to be distributed :**(solve any two)** PROJ(PNO,PNAME,BUDGET) PAY(TITLE,SALARY) EMP(ENO,ENAME,TITLE) ASG(ENO,PNO,RESPONSIBILITY,DURATION) a. Show 1 example of horizontal fragmentation b. Show 1 example of vertical fragmentation **OR** b. Write a query to find lowest-paid employee. (Consider a relation Horizontally fragmented).	10
Q.2	Explain with suitable example object identity, object structure and type constructors in ORDBMS.	10
Q.3	Write any **two** notes a. Data warehouse features b. OLTP Vs OLAP c. Spatial database components	10

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Semester: January 2023- May 2023		
Maximum Marks: 30	**Examination: In-Semester Examination**	**Duration :1Hr15Min**
Programme code: 66 **Programme:** Honours in Artificial Intelligence (Information Technology)	**Class:** SY BTECH	**Semester:** IV **(SVU 2020)**
Name of the Constituent College: **K. J. Somaiya College of Engineering**	**Name of the department:** IT	
Course Code: 116h66C402	**Name of the Course:** Introduction to Artificial Intelligence (Honours in Artificial Intelligence)	

Question No.		Max. Marks
Q1	AI agent is playing Stone-Paper-Scissor game against the human being. Categorize the agent environment for this game into following with proper justification • Observable/partially Observable/Unobservable • Single/Multi-agent • Deterministic/Stochastic • Episodic/Sequential • Static/Dynamic **OR** Consider A Water Jug Problem stated as below: 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? Express this problem in terms of state representation, Initial state, Goal state, Actions, Path Cost	10
Q2	Consider a state space where the start state is number 1 and each state k has two successor: numbers 2k and 2k+1 a. Draw the portion of state space tree for states 1 to 15 b. Suppose the goal state is 11, List the order in which the nodes will be visited using BFS and DFS. Write the contents of the fringe at each and every step of both the algorithms.	04 03+03
Q3	"5-Stone Nim" game is played with two players and pile of 5 stones. Each Player removes 1 or 2 stones from the pile. Player who removes last stone wins the games. Assume that first to remove the stone is Max player. Max and Min players play alternately. Generate the tree for 5-Stone Nim tree Identify the utility values at each leaf node Apply Min-Max algorithm Comment on the basis of the backed up value at the root node **OR**	03 02 03 02

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Apply A-Star algorithm on the following graph, Consider 'S' as initial node and 'G' as goal node

10