

22.05.2023 (E)



Maximum Marks: 100	Semester: Jan 2023 - May 2023 Examination: ESE Examination	Duration: 3 Hrs.
Programme code: 01/04	Class: SY	Semester: IV (SVU 2020)
Programme: B. Tech Computer/IT Engineering		
Name of the Constituent College: K. J. Somaiya College of Engineering	Name of the department: Computer/IT	
Course Code: 116U01C401/116U04C401	Name of the Course: Probability, Statistics and Optimization Techniques	
Instructions: 1) All questions are compulsory 2) Assume suitable data wherever necessary		

Que. No.	Question	Max. Marks																						
Q1	Solve any Four of the following.	20																						
i)	Three machines A, B, C produce respectively 60%, 30% & 10% of the total number of items of a factory. The percentage of defective outputs of these machines are respectively 2%, 3% & 4%. An item is chosen at random and found to be defective. Using Bayes theorem find the probability that it was produced by the factory A.	5																						
ii)	Compute Rank correlation coefficient from the following data	5																						
	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>x</td><td>105</td><td>104</td><td>102</td><td>101</td><td>100</td><td>99</td><td>98</td><td>96</td><td>93</td><td>92</td></tr> <tr> <td>y</td><td>101</td><td>103</td><td>100</td><td>98</td><td>95</td><td>96</td><td>104</td><td>92</td><td>97</td><td>94</td></tr> </table>	x	105	104	102	101	100	99	98	96	93	92	y	101	103	100	98	95	96	104	92	97	94	
x	105	104	102	101	100	99	98	96	93	92														
y	101	103	100	98	95	96	104	92	97	94														
iii)	A sample of 900 numbers has a mean 3.4 cms and s.d. 2.61 cms. If the population is normal, find the 95% and 98% confidence limits of the population mean.	5																						
iv)	Convert the given LPP into the standard form Minimise $z = 7x_1 - 48x_2 + 23x_3$ Subject to $61x_1 - 29x_2 + 12x_3 \leq 93$ $3x_1 - 61x_2 + 81x_3 \geq 9$ $x_1 - 33x_2 + 53x_3 \leq -5$ where $x_1, x_2 \geq 0$ and x_3 is unrestricted in sign	5																						
v)	Find the average number of customers in the system and in the queue if the system is (M/M/1/ ∞) and $\mu = 10, \lambda = 8$ per hour	5																						
vi)	The joint probability distribution function of (X, Y) is given by $f(x, y) = xy^2 + \frac{x^2}{8}$ where $0 \leq x \leq 2, 0 \leq y \leq 1$. Compute (a) $P(X > 1)$ (b) $P(Y < 0.5)$ (c) $P(X > 1 Y < 0.5)$	5																						
Q2 A	Solve the following.	10																						
i)	The regression lines of a sample are $x + 6y = 6$ and $3x + 2y = 10$. Find (a) \bar{x} and \bar{y} (b) correlation coefficient r. Also estimate y when x = 12. (c) verify that the sum of the coefficients of regression is greater than 2r	5																						
ii)	A sample of 50 pieces of certain type of string was tested. The mean breaking strength turned out to be 14.5 pounds. Test whether the sample is from a batch of string having a mean breaking strength of 15.6 pounds & standard deviation of 2.2 pounds.	5																						

OR

Q2 A	<p>Using Lagrange's Multiplier method solve the following NLPP</p> $z = 2x_1^2 + x_2^2 + 3x_3^2 + 10x_1 + 8x_2 + 6x_3 - 100$ <p>subject to $x_1 + x_2 + x_3 = 20$,</p> $x_1, x_2, x_3 \geq 0$	10																						
Q 2 B	Solve any One of the following.	10																						
i)	<p>The local one person barber shop can accommodate maximum of 5 people at a time (4 waiting and 1 getting haircut). Customers arrive according to a Poisson distribution with mean 5 per hour. The barber cuts hair according to an Exponential distribution at an average rate of 4 per hour.</p> <p>(a) What percentage of time is the barber idle?</p> <p>(b) What fraction of potential all customers are turned away?</p> <p>(c) What is the expected number of customers waiting for a haircut?</p> <p>(d) How much time can a customer expect to spend in the barber shop?</p>	10																						
ii)	<p>Define probability mass function of Poisson distribution and Fit a Poisson distribution to the following data if the following mistakes per page were observed in a book.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>No. of mistakes</th> <th>0</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>Total</th> </tr> </thead> <tbody> <tr> <th>No. of pages</th> <td>211</td> <td>90</td> <td>19</td> <td>5</td> <td>0</td> <td>325</td> </tr> </tbody> </table>	No. of mistakes	0	1	2	3	4	Total	No. of pages	211	90	19	5	0	325	10								
No. of mistakes	0	1	2	3	4	Total																		
No. of pages	211	90	19	5	0	325																		
Q3	Solve any Two of the following.	20																						
i)	<p>(a) The height of 1000 soldiers in a regiment are distributed normally with mean 172 cm and standard deviation 5 cm. how many soldiers have height greater than 180 cm.</p>	05																						
	<p>(b) Two groups A & B of patients each consisting of 200 people are used to test effectiveness of a new serum. Group A is given serum while group B not. It is found that mean of two groups of A & B are 140 & 120 respectively and standard deviation of 14 & 12 respectively. Test at 1% LOS whether the new serum helps to cure the disease.</p>	05																						
ii)	<p>Find the lines of regression for the following data to estimate y corresponding to $x = 155$ and value of x corresponding to $y = 152$</p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <tr> <td>x</td><td>100</td><td>110</td><td>120</td><td>130</td><td>140</td><td>150</td><td>160</td><td>170</td><td>180</td><td>190</td> </tr> <tr> <td>y</td><td>45</td><td>51</td><td>54</td><td>61</td><td>66</td><td>70</td><td>74</td><td>78</td><td>85</td><td>89</td> </tr> </table>	x	100	110	120	130	140	150	160	170	180	190	y	45	51	54	61	66	70	74	78	85	89	10
x	100	110	120	130	140	150	160	170	180	190														
y	45	51	54	61	66	70	74	78	85	89														
iii)	<p>Define the following terms Solution of LPP, Basic solution of LPP, Feasible solution and degenerate solution of LPP. Also Find (a) All basic solutions (b) All feasible basic solutions (c) All degenerate solutions hence decide the optimal feasible basic for the following L.P.P.</p> <p>Maximise $z = 2x_1 + 3x_2 + x_3 + x_4$ Subject to $x_1 - 3x_2 + 2x_3 + x_4 = 5$ $x_1 + x_2 + 3x_3 - 2x_4 = 4$ where $x_1, x_2, x_3, x_4 \geq 0$</p>	10																						

Q4	Solve any Two of the following.	20																				
i)	The probability that an electronic component will fail in less than 1200 hours of continuous use is 0.25 Use Normal approximations to find the probability that among 200 such components exactly 45 will fail in less than 1200 hours of continuous use.	10																				
ii)	A certain drug is claimed to be effective in curing cold in an experiment on 500 persons with cold. Half of them were given drug and half of them were given the sugar pills. The patients reaction to the treatment are recorded in the following table using χ^2 -test (use 5% LOS)	10																				
	<table border="1"> <thead> <tr> <th></th> <th>Helped</th> <th>Harmed</th> <th>No Effect</th> <th>Total</th> </tr> </thead> <tbody> <tr> <td>Drug</td> <td>150</td> <td>30</td> <td>70</td> <td>250</td> </tr> <tr> <td>Sugar pills</td> <td>130</td> <td>40</td> <td>80</td> <td>250</td> </tr> <tr> <td>Total</td> <td>280</td> <td>70</td> <td>150</td> <td>500</td> </tr> </tbody> </table> <p>On the basis of this data, can it be concluded that the drug and sugar pills differ significantly in curing cold.</p>		Helped	Harmed	No Effect	Total	Drug	150	30	70	250	Sugar pills	130	40	80	250	Total	280	70	150	500	
	Helped	Harmed	No Effect	Total																		
Drug	150	30	70	250																		
Sugar pills	130	40	80	250																		
Total	280	70	150	500																		
iii)	<p>Solve the given LPP by Simplex method</p> <p>Maximise $z = 4x_1 + 3x_2 + 6x_3$</p> <p>Subject to</p> $2x_1 + 5x_2 \leq 430$ $4x_1 + 3x_3 \leq 470$ $2x_1 + 3x_2 + 2x_3 \leq 440$ <p>where $x_1, x_2, x_3 \geq 0$</p>	10																				
Q5	Solve any Four of the following.	20																				
i)	X follows a Uniform Distribution over the range (2,b) such that $P(3 < X < 6) = 0.3$ Find mean and variance of X.	5																				
ii)	If the tangent of the angle made by the lines of regression of y on x is 0.6 and $\sigma_y = 2\sigma_x$, find the correlation coefficient between x and y.	5																				
iii)	A random sample of 400 items gives the mean 4.45 & variance 4. Can it be regarded as drawn from a normal population with mean 4 at 5% level of significance?	5																				
iv)	Find the relative maximum or minimum of the function $z = 20 + x_1 + 2x_3 + x_2x_3 - x_1^2 - x_2^2 - x_3^2$	5																				
v)	Find the traffic intensity of the system (M/M/1/ ∞) model if $\mu = 1$ per hour, $\lambda = 8$ per hour. Also find the probability that a customer has to wait for more than 20 minutes to be out of the service station.	5																				
vi)	<p>Obtain the dual of the following LPP</p> <p>Minimise $z = 3x_1 + 17x_2 + 9x_3$</p> <p>Subject to</p> $-x_2 + x_3 \geq 3$ $-3x_1 + 2x_3 \leq 1$ $2x_1 + x_2 - 5x_3 = 1$ <p>where $x_1, x_2, x_3 \geq 0$</p>	5																				



Semester: January 2023 – May 2023

Examination: ESE Examination

Duration: 3 Hrs.

Maximum Marks: 100

Programme code: 04

Programme: B Tech

Class: SY

Semester: IV (SVU 2020)

Name of the Constituent College:

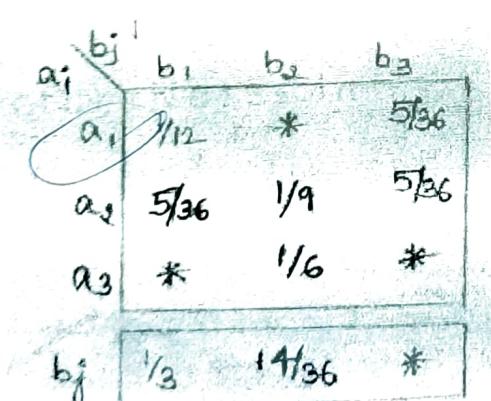
Name of the department: IT

K. J. Somaiya College of Engineering

Course Code: 116U04C402 Name of the Course: Information Theory and Coding

Instructions: 1) Draw neat diagrams 2) All questions are compulsory

3) Assume suitable data wherever necessary

Que. No.	Question	Max. Marks
Q1	Solve any Four	20
i)	Define self information. Why is logarithmic expression chosen for measuring information?	5
ii)	A code is composed of dots and dashes. A dash is 3 times as long as a dot, but has one third the probability of a dot. Calculate the information in the dash and the dot.	5
iii)	What is Joint Probability Matrix? Explain their properties.	5
iv)	Consider a source $S = \{S_1, S_2, S_3\}$ with $P = \{\frac{1}{2}, \frac{1}{4}, \frac{1}{4}\}$. Find the following: ↗ Self-information of each symbol ↗ Entropy of Source S	5
v)	A discrete source emits one of the six symbols once every m-sec. The symbol probabilities are $\frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{1}{16}, \frac{1}{32}$ and $\frac{1}{32}$ respectively. Find the source entropy and information rate.	5
vi)	A Joint Probability Matrix $P(A, B)$ is given below:-  Find the missing probabilities in the table.	5

Que. No.	Question	Max. Marks
Q2 A	Solve the following	10
i)	Given the messages $X_1, X_2, X_3, X_4, X_5, X_6$ with respective probabilities of 0.4, 0.2, 0.2, 0.1, 0.07, 0.03. Construct a binary code by applying Huffman encoding procedure. Determine the efficiency and redundancy of the code so formed.	5
ii)	Explain Run Length Encoding with example.	5

Q2 A	OR	
	Show the message encoding for the message "SAHARA" using the following encoding methods. Also calculate the source entropy, average length per symbol and the coding efficiency in each case:	10
	a) Shannon-Fano coding b) Huffman coding	
Q2 B	Solve any One	10
i)	Explain LZW technique with example and how LZW is different from arithmetic coding?	10
ii)	Write a note on Shannon-Fano Algorithm. Create a coding tree for the word "SPEAKER" using Shannon Fano. Explain how it is different from Huffman Coding	10

Que. No.	Question	Max. Marks
Q3	Solve any Two	20
i)	Define standard array. How is it used in syndrome decoding? Explain with an example.	10
ii)	Consider a (6,3) Linear Block Code whose generator matrix is $\left[\begin{array}{ccc ccc} 1 & 0 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 0 & 1 & 1 \end{array} \right]$ a) Find all code vectors (4 Marks) b) Find the minimum hamming distance d_{min} (3 Marks) c) Check if the received vector $r = [110111]$ contains any error using the syndrome method. (3 Marks)	10
iii)	Explain error control coding with a block diagram	10

Que. No.	Question	Max. Marks
Q4	Solve any Two	20
i)	Use the Chinese Remainder theorem to find x such that: a) $x \equiv 2 \pmod{3}$ b) $x \equiv 1 \pmod{5}$ c) $x \equiv 6 \pmod{7}$	10
ii)	Explain the following terms:- (a) Asymmetric Cryptography (b) Substitution Cipher	10
iii)	Use the Vigenere cipher method to encode and decode the message "GIRAFFE" using the encryption key "XYZ".	10

Que. No.	Question	Max. Marks
Q5	(Write notes / Short question type) on any four	20
i)	Fermat's little theorem with example	5
ii)	Joint and Conditional Entropy	5
iii)	Image compression	5
iv)	Explain error detection using Cyclic Redundancy Check with an example	5
v)	Explain the importance of Prime number generation with two application areas	5
vi)	Affine cipher with example	5



Semester: January 2023 – May 2023

Examination: ESE Examination

Duration: 3 Hrs.

Maximum Marks: 100

Programme code: 01+

Programme: B-Tech IT

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

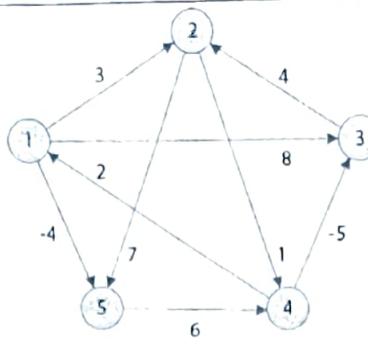
Name of the Course: Analysis of Algorithms

Instructions: 1) Draw neat diagrams 2) All questions are compulsory

3) Assume suitable data wherever necessary

Que. No.	Question	Max. Marks
Q1	Solve any Four	20
i)	Define and explain Big- O, Ω , Θ notations for time complexity with Diagram.	5
ii)	Find the complexity of following recurrence relation using recursion tree technique and prove the result using substitution technique. $T(n) = 4T(n/4) + n$	5
iii)	Sort the following element (8, 5, 2, 3, 9, 4) using Insertion Sort	5
iv)	Sort the following element (6, 4, 5, 2, 5, 4, 2, 4, 0) using Counting Sort	5
v)	Write the algorithm/pseudo code for Sum of Subset Problem using Backtracking Approach.	5
vi)	Write the algorithm/pseudo code for TSP Problem using Branch and Bound Approach.	5

Que. No.	Question	Max. Marks																
Q2 A	Solve the following	10																
i)	State the difference between Quick sort and Randomized Quick sort	5																
ii)	Derive Quick sort recurrence relation time complexity using Substitution method & Master method.	5																
OR																		
Q2 A	Explain what are Max Heap and Min Heap? Derive the time complexity of heap sort algorithm in detail?	10																
Q2 B	Solve any One	10																
i)	Consider the following table of Optimal Binary Search Technique (OBST)	10																
	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>Keys</td> <td>A</td> <td>B</td> <td>C</td> <td>D</td> <td>E</td> <td>F</td> <td>G</td> </tr> <tr> <td>Frequency</td> <td>4</td> <td>2</td> <td>1</td> <td>3</td> <td>5</td> <td>2</td> <td>1</td> </tr> </table> Using dynamic algorithm formulas find the optimal Cost and construct the final OBST	Keys	A	B	C	D	E	F	G	Frequency	4	2	1	3	5	2	1	
Keys	A	B	C	D	E	F	G											
Frequency	4	2	1	3	5	2	1											
ii)	Solve the following graph to find shortest path using Floyd-Warshall algorithm and state shortest path from source '4' to all destination with their cost.	10																



Que. No.	Question	Max. Marks																					
Q3	Solve any Two	20																					
i)	Consider the instance of knapsack problem where $n=6$, $M=15$, profits are $\{p_1, p_2, p_3, p_4, p_5, p_6\} = \{1, 2, 4, 4, 7, 2\}$ and weights are $\{w_1, w_2, w_3, w_4, w_5, w_6\} = \{10, 5, 4, 2, 7, 4\}$. Find Maximum Profit using Fractional Knapsack and 0/1 knapsack Approach. Also explain which Approach is better in different scenario and justify the same.	10																					
ii)	Given the jobs, their deadlines and associated profits are as follows:- <table border="1"> <thead> <tr> <th>Jobs</th><th>J1</th><th>J2</th><th>J3</th><th>J4</th><th>J5</th><th>J6</th></tr> </thead> <tbody> <tr> <td>Deadlines</td><td>5</td><td>3</td><td>3</td><td>2</td><td>4</td><td>2</td></tr> <tr> <td>Profits</td><td>200</td><td>180</td><td>190</td><td>300</td><td>120</td><td>130</td></tr> </tbody> </table> Answer the following questions :- a) Write the optimal schedule that gives maximum profit. b) Are all the jobs completed in the optimal schedule? c) What is the maximum earned profit? d) Write the algorithm for job sequencing with deadline.	Jobs	J1	J2	J3	J4	J5	J6	Deadlines	5	3	3	2	4	2	Profits	200	180	190	300	120	130	10
Jobs	J1	J2	J3	J4	J5	J6																	
Deadlines	5	3	3	2	4	2																	
Profits	200	180	190	300	120	130																	
iii)	Distinguish between Greedy and Dynamic Programming with example (Min 6 Points)	10																					

Que. No.	Question	Max. Marks
Q4	Solve any Two	20
i)	What do you understand by P, NP, NP-Hard, NP-Complete Problems/Algorithms?	10
ii)	Prove that 0/1 Knapsack problem is NP-Complete?	10
iii)	Prove that Travelling salesman problem is NP-Complete?	10

Que. No.	Question	Max. Marks
Q5	(Write notes / Short question type) on any four	20
i)	Write the algorithm/pseudo code for Selection Sort Algorithm.	5
ii)	Write the algorithm/pseudo code for Radix Sort Algorithm.	5
iii)	Write the algorithm/pseudo code for Kruskal's Algorithm for MST	5
iv)	Write the algorithm/pseudo code for TSP using dynamic approach.	5
v)	Write the algorithm/pseudo code for Hamiltonian Circuit Problem using Backtracking Approach.	5
vi)	Write the algorithm/pseudo code for 15 Puzzle Problem using Branch and Bound Approach.	5



Semester: JAN 2023 – MAY 2023

Examination: ESE Examination

Duration: 3 Hrs.

Maximum Marks: 100

Examination: ESE Examination

Duration: 3 Hrs.

Programme code:) 04-

Class: SY

Semester: IV (SVU 2020)

Programme: BTech IT

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

Instructions: 1) Draw neat diagrams 2) All questions are compulsory

3) Assume suitable data wherever necessary

Que. No.	Question	Max. Marks
Q1	Solve any Four	20
i)	Describe Locational & naming Transparencies	5
ii)	Demonstrate creation of UDT's using CREATE command in ORDBMS and hence creation of table using this UDT.	5
iii)	Differentiate Data Warehouse Vs Data Marts	5
iv)	List different parameters to be considered for initial loading in Datawarehouse.	5
v)	Explain destructive and Constructive merge technique while loading /appending the data.	5
vi)	Justify the need of distributed databases.	5

Que. No.	Question	Max. Marks																													
Q2 A	Solve the following	10																													
i)	Illustrate TYPE-II changes on Data warehouse w.r.t. following points: The definition, Procedure to apply the change, Example illustrating the procedure.	5																													
ii)	Compare Incremental Load and Data Refresh concepts.	5																													
	OR																														
Q2 A	<p>Observe following Star Schema and answer the following:</p> <p>PRODUCT</p> <table border="1"> <tr><td>Product Key</td></tr> <tr><td>Product Name</td></tr> <tr><td>Product Code</td></tr> <tr><td>Product Line</td></tr> <tr><td>Brand</td></tr> </table> <p>TIME</p> <table border="1"> <tr><td>Time Key</td></tr> <tr><td>Date</td></tr> <tr><td>Month</td></tr> <tr><td>Quarter</td></tr> <tr><td>Year</td></tr> </table> <p>ORDER FACTS</p> <table border="1"> <tr><td>Product Key</td></tr> <tr><td>Time Key</td></tr> <tr><td>Customer Key</td></tr> <tr><td>Salesperson Key</td></tr> <tr><td>Order Dollars</td></tr> <tr><td>Cost Dollars</td></tr> <tr><td>Margin Dollars</td></tr> <tr><td>Sale Units</td></tr> </table> <p>CUSTOMER</p> <table border="1"> <tr><td>Customer Key</td></tr> <tr><td>Customer Name</td></tr> <tr><td>Customer Code</td></tr> <tr><td>Marital Status</td></tr> <tr><td>Address</td></tr> <tr><td>State</td></tr> <tr><td>Zip</td></tr> </table> <p>SALESPERSON</p> <table border="1"> <tr><td>Salesperson Key</td></tr> <tr><td>Salesperson Name</td></tr> <tr><td>Territory Name</td></tr> <tr><td>Region Name</td></tr> </table>	Product Key	Product Name	Product Code	Product Line	Brand	Time Key	Date	Month	Quarter	Year	Product Key	Time Key	Customer Key	Salesperson Key	Order Dollars	Cost Dollars	Margin Dollars	Sale Units	Customer Key	Customer Name	Customer Code	Marital Status	Address	State	Zip	Salesperson Key	Salesperson Name	Territory Name	Region Name	10
Product Key																															
Product Name																															
Product Code																															
Product Line																															
Brand																															
Time Key																															
Date																															
Month																															
Quarter																															
Year																															
Product Key																															
Time Key																															
Customer Key																															
Salesperson Key																															
Order Dollars																															
Cost Dollars																															
Margin Dollars																															
Sale Units																															
Customer Key																															
Customer Name																															
Customer Code																															
Marital Status																															
Address																															
State																															
Zip																															
Salesperson Key																															
Salesperson Name																															
Territory Name																															
Region Name																															
	<p>1 Explain Drill Down and Roll-up operation w.r.t above table.</p> <p>2 Show SLICE operation on Order_Data dimension, keeping all other dimensions' value constant.</p>																														

	<p>3. With an example describe DICE operation.</p> <p>4. Identify Foreign keys and Primary key of the FACT table</p> <p>5. If it is required to create FACTLESS FACT table, What will be the attributes in this FACTLESS FACT table?</p>	
Q2 B	Solve any One	10
i)	Explain Primary Site and Primary Site with backup technique to implement Concurrency control in Distributed database.	10
ii)	Explain architectures and implementation basics of Distributed Databases	10

Que. No.	Question	Max. Marks
Q3	Solve any Two	20
i)	Explain Two Phase Commit (2PC) in distributed database system.	10
ii)	Demonstrate the need of 3PC (Three Phase Commit) protocol (Hint: w.r.t. 2PC)	10
iii)	What is in memory database? Which kind of applications these databases are useful? Justify your answer.	10

Que. No.	Question	Max. Marks
Q4	Solve any Two	20
i)	What are aggregate fact tables? Why are they needed? Give an example.	10
ii)	Name five types of the major transformation tasks. Give an example for each	10
iii)	Describe types of Spatial Operators. Give detailed explanation of anyone with real life example.	10

Que. No.	Question	Max. Marks
Q5	Write notes on any four	20
i)	Concurrency Control mechanism in Distributed Databases	5
ii)	Key-Value architecture of NoSQL.	5
iii)	Meta data in data-warehouse	5
iv)	Any one Transformation type with example	5
v)	MOLAP model used in Data warehouse	5
vi)	Nested relations	5

02.06.2023(E)



SOMAIYA
VIDYAVIHAR UNIVERSITY

Semester: January 2023 --May 2023

Examination: ESE Examination

Duration: 3 Hrs.

Maximum Marks: 100

Programme code: 66

Programme: Honours in Artificial Intelligence

Class: SY

Semester: IV(SVU 2020)

Name of the Constituent College:

K. J. Somaiya College of Engineering

Name of the department: Information
Technology

Course Code: 116h66C401

Name of the Course: Introduction to Artificial Intelligence

Instructions: 1) Draw neat diagrams 2) All questions are compulsory

3) Assume suitable data wherever necessary

Que. No.	Question	Max. Marks
Q1	Solve any Four	20
i)	How does learning in a utility based agent different from a reflex agent. Explain with suitable example?	5
ii)	Explain PEAS descriptors of "Snakes and Ladders" game.	5
iii)	Properties of task environment of "Chess with clock" game.	5
iv)	Formulate problem for 8 Puzzle game.	5
v)	Compare DFS with IDS on the basis of time complexity, space complexity, optimality and completeness.	5
vi)	What is pruning? Explain Alpha Beta pruning with suitable example?	5

Que. No.	Question	Max. Marks
Q2 A	Solve the following	10
i)	What is Hill Climbing Algorithm? Explain its drawbacks and solutions to overcome those drawbacks?	5
ii)	Difference between Greedy BFS and A* search methods. (any five valid points)	5
Q2 B	Solve any One	10
i)	Solve Crypto-arithmetic problem using CSP. C R O S S + R O A D S _____ D A N G E R	10
ii)	Explain the steps used in Genetic algorithm with suitable example?	10

Que. No.	Question	Max. Marks
Q3	Solve any Two	20
i)	Convert following statements to First Order Logic(FOL) 1) There is a bunny who is a cute. 2) Every child who has a UNO card is cool. 3) Everyone at Mumbai is smart. 4) Blue databases are better than other databases. 5) The best score in AI2 is always higher than the best score in AI1.	10

ii)	What are the limitations of propositional logic? Explain quantifier operators supported in Predicate Logic with suitable example.	10
iii)	Describe forward and backward chaining algorithm with suitable example?	10

Que. No.	Question	Max. Marks																				
Q4	Solve any Two Given the full joint distribution below.	20																				
	<table border="1"> <thead> <tr> <th></th> <th colspan="2">Toothache</th> <th colspan="2">~ Toothache</th> </tr> <tr> <th></th> <th>Catch</th> <th>~ Catch</th> <th>Catch</th> <th>~ Catch</th> </tr> </thead> <tbody> <tr> <td>Cavity</td> <td>0.108</td> <td>0.012</td> <td>0.072</td> <td>0.008</td> </tr> <tr> <td>~Cavity</td> <td>0.016</td> <td>0.064</td> <td>0.144</td> <td>0.576</td> </tr> </tbody> </table> <p>Calculate the following</p> <p>a) $P(\text{toothache})$</p> <p>b) $P(\text{cavity})$</p> <p>c) $P(\text{toothache} \text{cavity})$</p> <p>d) $P(\text{Cavity} \text{toothache} \vee \text{catch})$</p>		Toothache		~ Toothache			Catch	~ Catch	Catch	~ Catch	Cavity	0.108	0.012	0.072	0.008	~Cavity	0.016	0.064	0.144	0.576	10
	Toothache		~ Toothache																			
	Catch	~ Catch	Catch	~ Catch																		
Cavity	0.108	0.012	0.072	0.008																		
~Cavity	0.016	0.064	0.144	0.576																		
ii)	Explain the steps to construct Bayesian network with suitable example?	10																				
iii)	What is Decision Tree? Explain ID3 Decision Tree Induction algorithm with suitable example?	10																				

Que. No.	Question	Max. Marks
Q5	(Write notes / Short question type) on any four	20
i)	Explain Bayes' rule and how it is used for uncertain reasoning?	5
ii)	Difference between Prediction and Irreducible error in learning?	5
iii)	Illustrate with an example any one application of Bayesian Networks	5
iv)	Define Variance error and differentiate between high and low variance Models?	5
v)	Explain Reinforcement learning with suitable example?	5
vi)	Explain Version Space search with suitable example?	5