2.6.2023 (E)

SOMAIYA VIDYAVIHAR UNIVERSITY

Semester: January 2023– May 2023 Maximum Marks:100 Examination: ESE Examination Duration:3 hrs		
Programme code: 54 Programme: Computer Engineering (Honours in Data Science and Analytics)	Class: SY	Semester: IV (SVU 2020)
Name of the Constituent College: K. J. Somaiya College of Engineering	Name of the Department: COMPUTER	
Course Code: 116h54C401	Name of the Course: Applied Data Science	
Instructions: 1)Draw neat diagrams 2)Assume suitable data if necessary		

Que. No.	Question	Max. Marks
Q1	Solve any **Four**	**20**
i)	Explain Applied Data Science challenges	5
ii)	What is Skewness w.r.t data explain with diagram	5
iii)	What is supervised and unsupervised methods of data modelling	5
iv)	Explain correlation and types of correlation with diagram	5
v)	Discuss with an example any 2 strategies of data transformation	5
vi)	Explain Statistical data modelling with example	5

Que. No.	Question	Max. Marks
Q2 A	Solve the following	**10**
i)	Explain normal distribution of data with bell curve	5
ii)	What are the Impact of applying Data Science in business -Online Railways Ticket booking	5
	OR	
Q2 A	Explain characteristics of Big data w.r.t Whats App Application	10
Q 2 B	Solve any **One**	**10**
i)	a.In the following table, the third column is the predicted probability(posterior) for the positive class in a binary classification problem. Assume that any test instances whose posterior probability is greater than threshold=0.5 will be classified as positive example. Compute the precision, Recall	10

Instances	True class	P(+/A,.....,Z,M1)
1	+	0.73
2	+	0.69
3	-	0.44
4	-	0.55
5	+	0.67
6	+	0.47
7	-	0.08
8	-	0.15
9	+	0.45
10	-	0.35

b. Give the different measures of central tendency for numerical data. Which is the robust measure? Why?

ii)	The following table shows the data collected by a state highway patrol safety division on stopping distances.	10

Speed(mph)	Stopping Distance (ft)
12	17.5
15	28
20	41.5
25	56
32	77.5
37	104
42	122
47	158
52	177.5
32	80

Predict the stopping distance for a vehicle travelling at 50mph using regression

Que. No.	Question	Max. Marks
Q3	Solve any **Two**	**20**
i)	For which type of data analysis following graphs are use - Histogram - Scatter plot - Box plot Explain with proper example	10
ii)	Why Pre-processing of data is required ? Explain any 3 pre-processing method with example	10
iii)	Explain The Data Science Process on Hospital Management data	10

Que. No.	Question	Max. Marks
Q4	Solve any **Two**	**20**
i)	a. Sales price records has been sorted as follows: (5,10,11,13,15,35,50,55,72,92,204,215) Partition the data into 3 clusters using using k-means (atleast 3 iteration) b. Compare k-Nearest Neighbours(k-NN) and k-means algorithms	10

ii)	Use given table and Bayes theorem to find : If the weather is sunny and wind is weak then the Player should play or not?	10

Sr No.	Wind	Weather	Play
0	weak	Rainy	Yes
1	Weak	Sunny	Yes
2	Strong	Overcast	Yes
3	Weak	Overcast	Yes
4	Strong	Sunny	No
5	Weak	Rainy	Yes
6	Weak	Sunny	Yes
7	Weak	Overcast	Yes
8	Weak	Rainy	No
9	Strong	Sunny	No
10	Weak	Sunny	Yes
11	Strong	Rainy	No
12	Weak	Overcast	Yes
13	Strong	Overcast	Yes

iii)	Using the following data set , predict whether a young person with low income, has own house or rented house by building decision tree.	10

No	Income	Age	Own house
1	Very high	Young	Yes
2	High	Middle	Yes
3	Low	Young	Rented
4	High	Middle	Yes
5	Very high	Middle	Yes
6	Medium	Young	Yes
7	High	Old	Yes
8	Medium	Middle	Rented
9	Low	Middle	Rented
10	Low	Old	Rented
11	High	Young	Yes
12	Medium	Old	Rented
13	Medium	Young	Rented

Que. No.	Question	Max. Marks
Q5	(Write notes / Short question type) on any **four**	**20**
i)	What Skill sets are needed for Applied Data Science	5
ii)	Feature Selection algorithm -Filters	5
iii)	Is Random Forest better compared to Decision tree? Justify your answer	5
iv)	Kurtios	5
v)	Draw confusion Matrix and explain	5

02.06.2023(E)

SOMAIYA VIDYAVIHAR UNIVERSITY

Semester: January 2023 –May 2023 Maximum Marks: 100 Examination: ESE Examination Duration:3 Hrs.		
Programme code: 55 Programme: Cyber Security & Forensics (Honors).	Class: S.Y.B.Tech	Semester: IV (SVU 2020)
Name of the Constituent College: K. J. Somaiya College of Engineering	Name of the department: Computer Engineering	
Course Code: 116h55C401	Name of the Course: Cyber Security, Forensics & Cyber Law.	
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)	Discuss the role of CERT in handling of cyber incidences.	5
ii)	List any five security mechanisms.	5
iii)	What do you understand by web jacking?	5
iv)	Define data carving? Explain with the help of an example.	5
v)	What is Juice-Jacking? Also mention the safe-guarding tips.	5
vi)	Illustrate the role of TOR browser in the field of cyber security.	5

Que. No.	Question	Max. Marks
Q2 A	Solve the following	**10**
i)	Is identity theft same as Phishing? Justify your answer with supporting example.	5
ii)	Elaborate on the origins of rootkits?	5
	OR	
Q2 A	Discuss the types of evidences procured through peripheral and hand-held devices with supporting examples.	10
Q 2 B	Solve ***any* One**	**10**
i)	Explain the working of SQL injection attack.	10
ii)	**Hotel CEO Finds Unwelcome Guests in Email Account:** The CEO of a boutique hotel realized their business had become the victim of wire fraud when the bookkeeper began to receive insufficient fund notifications for regularly recurring bills. A review of the accounting records exposed a serious problem. At some point a few weeks before, the CEO had clicked on a link in an email that they thought was from the IRS. It wasn't. When they clicked the link and entered their credentials, the cyber criminals captured the CEO's login information, giving them full access to intimate business and personal details. You are appointed as a consultant to handle the case. Please attempt the following questions: 1. Name the cyber-attack in the given scenario. 2. Briefly mention about the incident-response steps you will follow to handle the case. 3. List any two related tools to be used for investigation. 4. Suggest the lessons to be learnt by the organization.	10

Que. No.	Question	Max. Marks
Q3	Solve *any* **Two**	**20**
i)	What is system hardening? Briefly mention the steps to harden a Windows based system.	10
ii)	Mention the rules and guidelines for extraction of digital evidences.	10
iii)	Explain the role of forensic audit in cyber investigations. Illustrate on any one audit technique.	10

Que. No.	Question	Max. Marks
Q4	Solve *any* **Two**	**20**
i)	Discuss how port scanning can lead to network based attack with an example. List any two port scanning tools.	10
ii)	What do you understand by network forensics? Categorize different network based attacks.	10
iii)	What do you understand by email forensics? Mention the steps in carrying out such investigations.	10

Que. No.	Question	Max. Marks
Q5	Write Short notes on *any* **four**	**20**
i)	Data diddling.	5
ii)	Six A's of digital forensics.	5
iii)	Forensic Duplicates.	5
iv)	Dark Web.	5
v)	Indian IT Act 2000.	5
vi)	Intellectual Property Rights.	5

02.06.2023(E)

SOMAIYA
VIDYAVIHAR UNIVERSITY

Semester: January 2023 –May 2023 Maximum Marks: 100 Examination: ESE Examination Duration:3 Hrs.		
Programme code: 75 Programme: UG Minor in Computer Engg.	Class: SY	Semester: IV(SVU 2020)
Name of the Constituent College: K. J. Somaiya College of Engineering	Name of the department: Computer Engineering	
Course Code: 116m75C401	Name of the Course: Object Oriented Programming and Methodology	
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)	What is the difference between Java method and Java constructor?	5
ii)	List features of JAVA.	5
iii)	Explain wait() and notify() methods of a Thread class?	5
iv)	What is coupling and cohesion?	5
v)	Explain polymorphism in brief.	5
vi)	What are the differences between an abstract class and an interface?	5

Que. No.	Question	Max. Marks
Q2 A	Solve the following	10
i)	Explain how to implement aggregation relationship in the class diagram?	5
ii)	How multiplicity relationship is shown in the class diagram?	5
	OR	
Q2 A	Draw the class diagram based on the following scenario. In a university there are different classrooms, offices and departments. A department has a name and it contains many offices. A person working at the university has a unique ID and can be a professor or an employee. A professor can be a full, associate or assistant professor and he/she is enrolled in one department. Offices and classrooms have a number ID, and a classroom has a number of seats. Every employee works in an office.	10
Q 2 B	Solve any **One**	10
i)	Write a program to create a Class StringManipulation with the following member functions. • FindFrequencyCount() : the function will accept any character and will display the total number of appearances of the given character in the String. • ReplaceCharacter() : the function will modify the given string to replace the first character of the string by its equivalent upper case.	10
ii)	Write a program to accept n number of strings from the user and sort them in alphabetical order.	10

Que. No.	Question	Max. Marks
Q3	Solve any **Two**	20
i)	Write a program for which has a class Product with the following information Pid Pcost Pname Get the information of n products from the user and sort the products in an increasing order of the product cost. The function sort must be statically defined to invoke it without referring to any object.	10
ii)	Define a class Complex to implement complex numbers and define various mathematical functions on it using a menu driven pro Addition of Complex numbers Subtraction of Complex numbers Complex multiplication Division of Complex numbers toString() function to display a String representation of a complex number	10
iii)	Write a menu driven program to create a vector and populate it with the name of cities. Program should display following menu choices 1. Add city (if city name is already exist in the vector program then it should display appropriate message) 2. Remove city (If city doesn't exist in the vector then it should display appropriate message) 3. Sort List of city alphabetically Display cities (It should display the contents of vector using Iterator or Enumeration)	10

Que. No.	Question	Max. Marks
Q4	Solve any Two	**20**
i)	Write a program to accept number from the user and if the number contains digit 9 then it should throw an error message "Error: Number contains digit 9".	10
ii)	Draw and explain the lifecycle of a thread.	10
iii)	Create a Package myMath which has 2 classes factorial and power which has methods fact() and cal_pow() respectively. Create a main class which will use package and calculate cos (x) = 1 – (x2/2!) + (x4/4!) – (x6/6!) + … upto n terms (n given by user). sin (x) = x-x3/3!+x5/5!-x7/7!+..... upto n terms (n given by user).	10

Que. No.	Question	Max. Marks
Q5	Write short notes on following(any **four**)	**20**
i)	Garbage collection in Java	5
ii)	Modular programming approach.	5
iii)	Jagged array	5
iv)	String Buffer	5
v)	Access protection in packages	5
vi)	Throws keyword in Java.	5

02.06.2023(E)

SOMAIYA
VIDYAVIHAR UNIVERSITY

Semester: January 2023 –May 2023 Maximum Marks: 100 Examination: ESE Examination		Duration:3 Hrs.
Programme code: 41 Programme: Minor Programme in Artificial Intelligence and Machine Learning	Class: SY	Semester: IV (SVU 2020)
Name of the Constituent College: K. J. Somaiya College of Engineering	Name of the department: COMP	
Course Code: 116m41C401	Name of the Course: Data Science and Analytics	
Instructions: 1)Draw neat diagrams 2) All questions are compulsory 3) Assume suitable data wherever necessary		

Que. No.	Question	Max. Marks
Q1	Answer any **Four**	20
i)	Explain how social networking sites like Facebook and LinkedIn use the concept of datafication.	5
ii)	Explain the 5V's of Big Data in brief.	5
iii)	With the help of a neat, labelled diagram, illustrate the role of data scientist at each step of the data science process.	5
iv)	How does data science help in predicting customer behaviour and in performing competitor research?	5
v)	With the help of an example explain the features, the pros and the cons of key-value (KV) store databases.	5
vi)	Explain in detail two use cases for document store NoSQL databases	5

Que. No.	Question	Max. Marks
Q2 A	Solve the following	10
i)	Consider the following data: 38, 33, 41, 37, 54, 39, 38, 71, 49, 48, 42, 38 Find the mean, mode and median of the given data. What can you infer about the shape and symmetry of the given data from the mean, median and mode values?	5
ii)	For the same data as in the preceding question Q2 A (i), draw a box plot and identify the outliers.	5
	OR	
Q2 A	Examine the relationship between the age and price for used cars sold in the last year by a car dealership company, given the following data, where age is indicated by x in years and price is indicated by y in dollars:	10

X	4	4	5	5	7	7	8	9	10	11	12
Y	6300	5800	5700	4500	4500	4200	4100	3100	2100	2500	2200

Calculate the linear regression equation for the given data. Calculate the total error. Plot the points and the line that you obtain. Interpret the results.

Q 2 B	Solve any **One**	**10**
i)	The share price of two stocks, stock A and stock B, noted on ten different days are as follows:	10

Stock A	45	50	53	58	60	40	47	57	59	43
Stock B	9	8	8	7	5	6	7	8	5	8

Calculate Pearson's correlation coefficient for the given data. Interpret the result. Show the formula used and the steps in the calculation clearly.

ii)	Consider the score of 10 students in English and Maths that are mentioned in the following table.	10

X	56	75	45	71	62	64	58	80	76	61
Y	66	70	40	60	65	56	59	77	67	63

Calculate Spearman's rank correlation coefficient for the given data. Interpret the result. Show the formula used and the steps in the calculation clearly.

Que. No.	Question	Max. Marks
Q3	Solve any **Two**	**20**
i)	A large group of students took a test in Physics and the final grades have a mean of 70 and a standard deviation of 10. If we can approximate the distribution of these grades by a normal distribution, what percent of the students a) scored higher than 80? b) should pass the test (grades≥60)? c) should fail the test (grades<60)?	10
ii)	On average, a pair of running shoes can last 18 months if used every day. The length of time running shoes last is exponentially distributed. a) What is the probability that a pair of running shoes last more than 15 months? b) On average, how long would six pairs of running shoes last if they are used one after the other?	10
iii)	The number of industrial injuries per working week in a particular factory is known to follow a Poisson distribution with mean 0.5. Find the probability that: a) in a particular week there will be less than 2 injuries, b) in a particular week there will be more than 2 injuries, c) in a three week period there will be no injuries.	10

Que. No.	Question	Max. Marks
Q4	Solve any **Two**	**20**
i)	Shown below is a data stream with N=24. **101011000101110110010110** Employ DGIM algorithm to given stream and divide into buckets.	10
ii)	Explain the steps of FM algorithm. Suppose a stream consists of the integers 2, 1,6,1,5,9,2,3,5 . Let the hash functions all be of the form $h(x)=ax+b \bmod 16$ for some a and b. Treat the result as 4 bit binary integer. Determine the tail length for each stream element and the resulting estimate of the number of distinct elements using FM algorithm if the hash function is h(x)=2x+3 mod 16	10

iii)	A database has five transactions. Let *min_sup* be 60% and *min_conf* be 80% TID | Items_bought T100 | {M,O,N,K,E,Y} T200 | {D,O,N,K,E,Y} T300 | {M,A,K,E} T400 | {M,U,C,K,Y} T500 | {C,O,O,K,I,E} Find all frequent patterns using Apriori algorithm . List any 3 valid association rules with support, confidence	10

Que. No.	Question	Max. Marks
Q5	(Write notes / Short question type) on any **four**	**20**
i)	How does visualizing a data set improve the quality of analysis that can be performed on the data set?	5
ii)	How will you decide whether or not linear regression is an appropriate modelling technique for the given data?	5
iii)	What are the key concepts applied by the Savasere, Omiecinski, and Navathe (SON) algorithm that make it efficient to perform association rule mining on Big Data.	5
iv)	Give any two real life scenarios where data analysis has to be performed on large amount of streaming data.	5
v)	Which data visualization technique(s) will be the most suitable when studying the relationship between two variables a) When both the variables are quantitative? b) When one attribute is quantitative, and the other variable is categorical?	5
vi)	Explain the scenarios in which the following data visualization techniques are most suitable: a) Quantile quantile (QQ) plot b) Stacked bar chart	5

29.5.2023 (M)

SOMAIYA VIDYAVIHAR UNIVERSITY

Semester: January 2023 –May 2023 Maximum Marks: 100 Examination: ESE Examination		Duration:3 Hrs.
Programme code: 01 Programme: B Tech in Computer Engineering	Class: SY	Semester: IV(SVU 2020)
Name of the Constituent College: K. J. Somaiya College of Engineering	Name of the department: COMP	
Course Code: 116U01C404	Name of the Course: Theory of Automata with Compiler Design	
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)	Minimize the following FA with: 0 1 →A B D B* A C C B D D* C A Show step wise solution	5
ii)	What are some real-world applications of DFA and NFA in programming languages, compilers, and natural language processing?	5
iii)	Design a DFA that recognizes the language of all strings over {0, 1} that have an equal number of 0s and 1s.(State machine and table is expected, No simulation)	5
iv)	Design a NFA that recognizes the language of all strings over {a,b} that have 'bab' as a suffix.	5
v)	Write a regular expression for the language L = {w ∈ {a, b}* | w contains the substring ab} with explanation.	5
vi)	Explain how the product of FA can be used to solve the problem of language inclusion.	5

Que. No.	Question	Max. Marks
Q2 A	Solve the following	10
i)	Given the grammar S → A, A → AB | a, B → bB | ε, show derivation steps and construct a derivation tree for the string aaabbbb.	5
ii)	Use Arden's theorem to find a regular expression for the language L = {w ∈ {a, b}* | w contains at least three consecutive b's}.	5

	or	
Q2 A	How does the Chomsky hierarchy relate to the concepts of decidability and undecidability in formal language theory? Explain with suitable example.	10

Q 2 B	Solve any **One**	**10**
i)	Design a DFA to recognize the language of all strings over the alphabet {a,b} that have a length of at least 3 and end with the same symbol as their first symbol.	10
ii)	Design an NFA that recognizes the language of all strings over {a, b} that contain an odd number of occurrences of the substring aba or the substring bab.	10

Que. No.	Question	dMax. Marks
Q3	Solve any **Two**	**20**
i)	Design a Turing machine that accepts the language of all strings over the alphabet {0, 1} that represents binary numbers that are divisible by 3.	10
ii)	Design Turing machine to copy a string(Consider the single tape).	10
iii)	Design a Turing machine that accepts the language of all strings over the alphabet {a, b} that have an odd number of b's.	10

Que. No.	Question	Max. Marks
Q4	Solve any **Two**	**20**
i)	Construct a PDA for the CFG $G = (V, \Sigma, R, S)$ where $V = \{S, A, B\}$, $\Sigma = \{a, b\}$, $R = \{S \rightarrow A, A \rightarrow aA, A \rightarrow bB, B \rightarrow bB, B \rightarrow \varepsilon\}$.	10
ii)	Convert the PDA $(\{q0, q1, q2, q3\}, \{0, 1\}, \{Z0\}, \delta, q0, \{Z0\})$ with the following transition function: $\delta(q0, \lambda, Z0) = \{(q1, Z0)\}$ $\delta(q1, 0, Z0) = \{(q1, 0Z0)\}$ $\delta(q1, 1, Z0) = \{(q2, \lambda)\}$ $\delta(q2, 1, Z0) = \{(q2, \lambda)\}$ $\delta(q2, \lambda, Z0) = \{(q3, Z0)\}$ $\delta(q3, 0, 0) = \{(q3, \lambda)\}$ $\delta(q3, 1, 0) = \{(q3, \lambda)\}$ $\delta(q3, \lambda, Z0) = \{(q0, \lambda)\}$ to a CFG and simplify the resulting grammar.	10
iii)	Design a PDA for the language $L = \{w\#w^R \mid w \in \{a, b\}^*\}$, where # is a special symbol not in the alphabet and w^R denotes the reverse of w.	10

Que. No.	Question	Max. Marks
Q5	(Write notes / Short question type) on any **four**	**20**
i)	Show that the language of all valid parentheses expressions is a context-free language, but not a regular language.	5
ii)	Can every context-sensitive language be recognized by a linear bound automaton? Why or why not?	5
iii)	How does a PDA differ from a finite state automaton (FSA) and a Turing machine (TM)?	5
iv)	What are some real-world applications of Rice's Theorem?	5
v)	Can a problem that can be solved by a single-tape Turing machine also be solved by a multitape Turing machine? Justify.	5
vi)	What are some challenges associated with applying the pumping lemma for context-free languages in practice?	5

SOMAIYA VIDYAVIHAR UNIVERSITY

29.05.2023 (E)

Section - A

Maximum Marks: 50	Semester: January 2023 –May 2023 Examination: ESE Examination	Duration: 2Hrs.
Programme code: 01 Programme: B Tech in Computer Engineering	Class: SY	Semester: IV(SVU 2020)
Name of the Constituent College: K. J. Somaiya College of Engineering	Name of the department: COMP	
Course Code: 116U01C404	Name of the Course: Theory of Automata with Compiler Design	
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)	Minimize the following FA with: →A: 0 → B, 1 → D B*: 0 → A, 1 → C C: 0 → B, 1 → D D*: 0 → C, 1 → A Show step wise solution *(One mark for each step)*	5
ii)	What are some real-world applications of DFA and NFA in programming languages, compilers, and natural language processing? *(one mark for each application)*	5
iii)	Design a DFA that recognizes the language of all strings over {0, 1} that have an equal number of 0s and 1s.(State machine and table is expected, No simulation) *(State Diagram 2 ½ marks, State Table carry.2 ½ marks)*	5
iv)	Design a NFA that recognizes the language of all strings over {a,b} that have 'bab' as a suffix. *(State Diagram 2 ½ marks, State Table carry.2 ½ marks)*	5
v)	Write a regular expression for the language L = {w ∈ {a, b}* | w contains the substring ab} with explanation. *(One mark each correct step)*	5
vi)	Explain how the product of FA can be used to solve the problem of language inclusion. *(One mark each correct point)*	5

Que. No.	Question	Max. Marks
Q2	Solve any **Two**	**20**
i)	Consider a Turing machine that accepts the language of all strings over the alphabet {0, 1} that represents binary numbers that are divisible by 3. Write Logic. .....2 marks Write Rules.....3 Marks Draw diagram ....3 Marks Perform Simulation.....2 Marks	10
ii)	Consider the Turing machine which copies a string (Consider the single tape). Write Logic. .....2 marks Write Rules.....3 Marks Draw diagram ....3 Marks Perform Simulation.....2 Marks	10
iii)	Consider a Turing machine that accepts the language of all strings over the alphabet {a, b} that have an odd number of b's. Write Logic. .....2 marks Write Rules.....3 Marks Draw diagram ....3 Marks Perform Simulation.....2 Marks	10

Que. No.	Question	Max. Marks
Q3	Answer the following objective type questions	**10**
i	The _____ is a procedure that transforms a context-free grammar into an equivalent pushdown automaton.	**1 mark**
ii	A _____ is an automaton that has both a pushdown stack and a two-dimensional tape for computation.	**1 mark**
iii	Consider a finite state automaton (FSA) with 4 states and an input alphabet {0, 1}. Each state has 2 outgoing transitions, one for each input symbol. How many transitions are there in total in this FSA?	**2 marks**
iv	A pushdown automaton (PDA) has a stack that can hold a maximum of 10 symbols. If the PDA starts with an empty stack and performs the following sequence of operations: push, pop, push, push, pop, push, how many symbols are in the stack after these operations?	**2 marks**
v	Consider a Turing machine (TM) with an input tape containing a binary number: 101011. The TM's transition function specifies that if the current state is A and the current tape symbol is 0, it should replace the 0 with 1 and move one cell to the right. How does the tape look after the TM halts?	**2 marks**
vi	Consider a pushdown automaton (PDA) with a stack alphabet {0, 1} and an input alphabet {a, b}. The PDA has 3 states and a maximum stack depth of 5. If the PDA starts with an empty stack and processes the input string "ababba", will it reach a final state?	**2 marks**

SOMAIYA VIDYAVIHAR UNIVERSITY

29.05.2023 (E)

Section - B

Maximum Marks: 50	Semester: January 2023 –May 2023 Examination: ESE Examination	Duration: 2 Hrs.
Programme code: 01 Programme: B Tech in Computer Engineering	Class: SY	Semester: IV(SVU 2020)
Name of the Constituent College: K. J. Somaiya College of Engineering	Name of the department: COMP	
Course Code: 116U01C404	Name of the Course: Theory of Automata with Compiler Design	
Instructions: 1)Draw neat diagrams 2) All questions are compulsory 3) Assume suitable data wherever necessary		

Que. No.	Question	Max. Marks
Q4	(Write notes / Short question type) on any **four**	**20**
i)	Show that the language of all valid parentheses expressions is a context-free language, but not a regular language. *(Example to demonstrate carries 5 marks)*	5
ii)	Can every context-sensitive language be recognized by a linear bound automaton? Why or why not? *(Reply carry 1 mark, justification 1mark each correct point)*	5
iii)	How does a PDA differ from a finite state automaton (FSA) and a Turing machine (TM)? *(1 mark for each correct difference)*	5
iv)	What are some real-world applications of Rice's Theorem? (2 ½ mark for each application with explanation)	5
v)	Can a problem that can be solved by a single-tape Turing machine also be solved by a multitape Turing machine? Justify. *(Reply carry 1 mark, justification 1mark each correct point)*	5
vi)	What are some challenges associated with applying the pumping lemma for context-free languages in practice?	5

Que. No.	Question	Max. Marks
Q5	Solve any **Two**	**20**
i)	Construct a PDA for the CFG $G = (V, \Sigma, R, S)$ where $V = \{S, A, B\}$, $\Sigma = \{a, b\}$, $R = \{S \rightarrow A, A \rightarrow aA, A \rightarrow bB, B \rightarrow bB, B \rightarrow \varepsilon\}$. Write Logic. .....2 marks Write Rules.....3 Marks Draw diagram ....3 Marks Perform Simulation.....2 Marks	10

ii)	Convert the PDA ({q0, q1, q2, q3}, {0, 1}, {Z0}, δ, q0, {Z0}) with the following transition function: δ(q0, λ, Z0) = {(q1, Z0)} δ(q1, 0, Z0) = {(q1, 0Z0)} δ(q1, 1, Z0) = {(q2, λ)} δ(q2, 1, Z0) = {(q2, λ)} δ(q2, λ, Z0) = {(q3, Z0)} δ(q3, 0, 0) = {(q3, λ)} δ(q3, 1, 0) = {(q3, λ)} δ(q3, λ, Z0) = {(q0, λ)} to a CFG and simplify the resulting grammar. Write Logic.....3 marks Convert Rules to CFG.....5 Marks Simplification of grammar.....2 Marks	10
iii)	Given the grammar S → A, A → AB | a, B → bB | ε, show derivation steps and construct a derivation tree for the string aaabbbb. *(One mark each correct step)* and How does the Chomsky hierarchy relate to the concepts of decidability and undecidability in formal language theory (4 marks)? Explain with suitable example(explanation carry 2 marks, 4 marks for example).	10 (Each question carry 5 marks each)

Que. No.	Question	Max. Marks
Q6	Answer the following objective type questions	10
i	The Myhill-Nerode theorem is used to characterize: A) Regular languages B) Context-Free languages C) Context-Sensitive languages D) Recursively Enumerable languages	1 mark
ii	A) Regular language B) Context-free language C) Context-sensitive language D) Recursively enumerable language	1 mark
iii	How many states are required in a deterministic finite automaton (DFA) to recognize the language L = {w | w contains an even number of '1's} over the alphabet {0, 1}? A) 1 B) 2 C) 3 D) 4	1 mark

iv	Consider a pushdown automaton (PDA) with a stack that can hold a maximum of 5 symbols. How many distinct configurations can the PDA have at any given step? A) 5 B) 10 C) 15 D) 20	1 mark
v	A finite state automaton (FSA) has 5 states, with one designated as the initial state and two designated as final states. How many different strings of length 3 can be accepted by this FSA? A) 20 B) 25 C) 30 D) 35	1 mark
vi	Consider a context-free grammar with 3 non-terminals and 5 terminals. If each non-terminal can produce up to 2 terminals or non-terminals, what is the maximum number of possible productions in this grammar? A) 6 B) 12 C) 18 D) 24	1 mark
vii	How many states are present in a minimal DFA that recognizes the language L = {w | w is a string of 0s and 1s with an odd number of 1s}? A) 1 B) 2 C) 3 D) 4	1 mark
viii	Consider a regular expression (0 + 1)*. How many strings of length 3 can be generated by this regular expression? A) 3 B) 6 C) 8 D) 16	1 mark
ix	A context-free grammar (CFG) has the following production rule: S -> aSb. Starting with the non-terminal S, how many strings of the form a^n b^n (where n ≥ 1) can be generated by this CFG? A) 1 B) n C) n + 1 D) 2^n	1 mark
x	How many distinct equivalence classes are generated by the Myhill-Nerode theorem for the language L = {w | w is a string of 0s and 1s with an equal number of 0s and 1s}? A) 1 B) 2 C) 3 D) Infinite	1 mark

26.05.2023 (E)

SOMAIYA
VIDYAVIHAR UNIVERSITY

Semester: January 2023 –May 2023 Maximum Marks: 100 Examination: ESE Examination		Duration:3 Hrs.
Programme code: 01 Programme: B.Tech (Computer Engineering)	Class: SY	Semester:IV(SVU 2020)
Name of the Constituent College: K. J. Somaiya College of Engineering	Name of the department: COMP	
Course Code: 116U01C403	Name of the Course: Relational Database Management Systems	
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)	Write the characteristics of DBMS.	5
ii)	Compare ER and EER model	5
iii)	Explain the use of views in SQL	5
iv)	Why do we need hashing?	5
v)	What are the objectives of Normalization?	5
vi)	What are the ACID properties in DBMS?	5

Que. No.	Question	Max. Marks
Q2 A	Solve the following	**10**
i)	Explain the different types of users who play different role in DBMS.	5
ii)	Compare File system and DBMS.	5
	OR	
Q2 A	Explain types of data model.	10
Q 2 B	Solve any **One**	**10**
i)	What is relational algebra? Explain the basics operations in relational algebra.	10
ii)	Write the differences between DDL and DML commands.	10

Que. No.	Question	Max. Marks
Q3	Solve any **Two**	**20**
i)	Explain query processing in DBMS.	10
ii)	Explain types of hashing techniques.	10
iii)	Explain triggers in SQL	10

Que. No.	Question	Max. Marks
Q4	Solve any **Two**	**20**
i)	What is Functional Dependency? Explain types of functional dependencies.	10
ii)	How does Concurrency control work in DBMS.	10
iii)	Explain recovery techniques in DBMS.	10

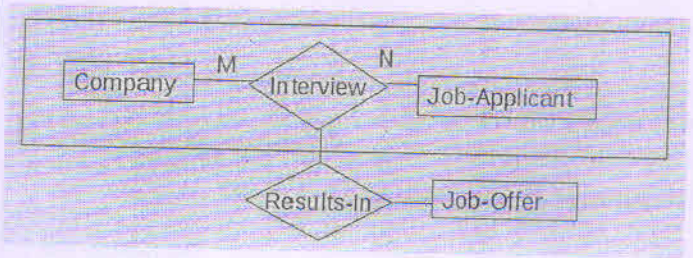
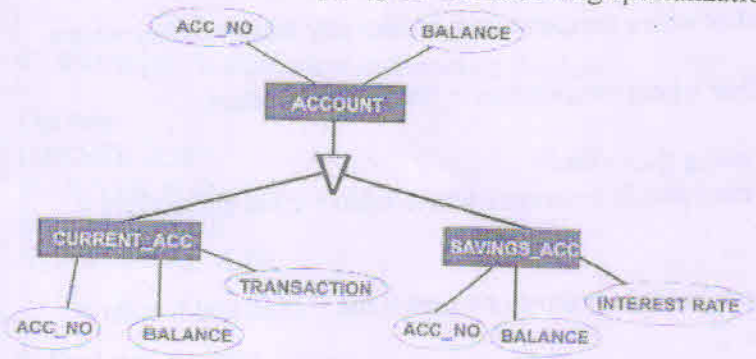
Que. No.	Question	Max. Marks
Q5	(Write notes / Short question type) on any**four**	**20**
i)	Steps in data modelling.	5
ii)	Security and Authorization in SQL.	5
iii)	Types of Constraints in DBMS	5
iv)	Deadlock handling.	5
v)	Differences between Ordered Indexing and Hashing.	5
vi)	Query Optimization	5

SOMAIYA VIDYAVIHAR UNIVERSITY

26.05.2023 (E)

Semester: January 2023– May 2023 Maximum Marks: 50 Examination: ESE Examination		Duration:3 hrs
Programme code: 01 Programme: B.Tech Computer Engineering	Class: SY	Semester: IV (SVU 2020)
Name of the Constituent College: K. J. Somaiya College of Engineering	Name of the department: COMP	
Course Code: 116U01C403	Name of the Course: Relational Database Management System	

Instructions:
1) All Questions are Compulsory.
2) Draw neat diagrams.
3)Assume suitable data if necessary.

Question No.	Section A	Max. Marks
Q 1	**Attempt any four.** i) List and explain the various users of database and their roles. ii) Describe different applications of database. iii) State and explain concerns while using an enterprise database. iv) State the difference between physical data independence and logical data independence. v) Explain the role of database administrator. vi) State characteristics of Database System.	20 M
Q 2	**Attempt any four from the following** i) Explain the distinction between disjoint and overlapping constraints. ii) Show the relational mapping for the following. consider any attributes for entity shown in the diagram.  iii) Explain aggregate functions in SQL with syntax and example. iv) Describe security mechanism in SQL. v) Show the relational mapping for the following specialization:  	20 M

	vi) Write a note on total participation and partial participation. Give suitable example.	
Q 3	1) Given the following statements: S1: A foreign key declaration can always be replaced by an equivalent check assertion in SQL. S2: Given the table R(a,b,c) where a and b together form the primary key, the following is a valid table definition. CREATE TABLE S (a INTEGER, d INTEGER, e INTEGER, PRIMARY KEY (d), FOREIGN KEY (a) references R) Which one of the following statements is CORRECT? Options - i) S1 is TRUE and S2 is FALSE ii) Both S1 and S2 are TRUE iii) S1 is FALSE and S2 is TRUE iv) Both S1 and S2 are FALSE 2) Which of the following statements are TRUE about an SQL query? P: An SQL query can contain a HAVING clause even if it does not have a GROUP BY clause Q: An SQL query can contain a HAVING clause only if it has a GROUP BY clause R: All attributes used in the GROUP BY clause must appear in the SELECT clause S: Not all attributes used in the GROUP BY clause need to appear in the SELECT clause Options- i) P and R ii) P and S iii) Q and R iv) Q and S 3) Find all tuples having temperature greater than 'Paris'. Options- i) select * from weather where temperature > (select temperature from weather where city = 'Paris') ii) select * from weather where temperature > (select * from weather where city = 'Paris') iii) select * from weather where temperature > (select city from weather where city = 'Paris') iv) select * from weather where temperature > 'Paris' temperature 4) What does the following query find? (select distinct r.sid from boats b, reserves r where b.bid = r.bid and b.color = 'red') MINUS (select distinct r.sid from boats b, reserves r where b.bid = r.bid and b.color = 'green') Options-	10 M

i) Find the sailor IDs of all sailors who have reserved red boats but not green boats
ii) Find the sailor IDs of atleast one sailor who have reserved red boats but not green boats
iii) Find the sailor IDs of atmost one sailor who have reserved red boats but not green boats
iv) None of these

5) Consider the following relations A, B and C:

A

Id	Name	Age
12	Arun	60
15	Shreya	24
99	Rohit	11

B

Id	Name	Age
15	Shreya	24
25	Hari	40
98	Rohit	20
99	Rohit	11

C

Id	Phone	Area
10	2200	02
99	2100	01

How many tuples does the result of the following SQL query contain?
Select A.Id from A where A.Age > ALL (select B.Age from B where B.Name = 'Arun')
Options-
i) 4
ii) 3
iii) 0
iv) 1

6) A command to remove a relation from an SQL database
Options-
i) Delete table <table name>
ii) Drop table <table name>
iii) Erase table <table name>
iv) Alter table <table name>

7) The CREATE TRIGGER statement is used to create the trigger. THE _____ clause specifies the table name on which the trigger is to be attached. The _____ specifies that this is an AFTER INSERT trigger.

Options-
i) for insert, on
ii) on, for insert
iii) for, insert
iv) both a and c

8) Which join is equivalent to Cartesian Product?

Options-
i) INNER JOIN
ii) OUTER JOIN
iii) CROSS JOIN
iv) NATURAL JOIN

9) Evaluate this SQL statement:

```
SELECT employee_id, e.department_id, department_name, salary
FROM employees e, departments d
WHERE e.department_id = d.department_id;
```

Which SQL statement is equivalent to the above SQL statement?

Options-

i)
```
SELECT employee_id, department_id, department_name, salary
FROM employees
WHERE department_id IN (SELECT department_id
FROM departments);
```

ii)
```
SELECT employee_id, department_id, department_name, salary
FROM employees
NATURAL JOIN departments;
```

iii)
```
SELECT employee_id, d.department_id, department_name, salary
FROM employees e
JOIN departments d
ON e.department_id = d.department_id;
```

iv) None of these

10) What is true about views among all the given below statements:

Options -

i) View never references actual table for which it is created.
ii) View can't use JOIN in it's query.
iii) The performance of the view degrades if they are based on other views.
iv) Only option to safeguard data integrity.

```
SELECT employee_id, e.department_id, department_name, salary
FROM employees e, departments d
WHERE e.department_id = d.department_id;
```

Which SQL statement is equivalent to the above SQL statement?

Options-

i)
```
SELECT employee_id, department_id, department_name, salary
FROM employees
WHERE department_id IN (SELECT department_id
FROM departments);
```

ii)
```
SELECT employee_id, department_id, department_name, salary
FROM employees
NATURAL JOIN departments;
```

iii)
```
SELECT employee_id, d.department_id, department_name, salary
FROM employees e
JOIN departments d
ON e.department_id = d.department_id;
```

iv) None of these

10) What is true about views among all the given below statements:

Options -

i) View never references actual table for which it is created.
ii) View can't use JOIN in it's query.
iii) The performance of the view degrades if they are based on other views.
iv) Only option to safeguard data integrity.

26.05.2023 (E)

SOMAIYA VIDYAVIHAR UNIVERSITY

Semester: January 2023 – May 2023 Maximum Marks: 50 Examination: ESE Examination Duration: 3 hrs		
Programme code: 01 Programme: B.Tech Computer Engineering	Class: SY	Semester: IV (SVU 2020)
Name of the Constituent College: K. J. Somaiya College of Engineering	Name of the department: COMP	
Course Code: 116U01C403	Name of the Course: Relational Database Management System	

Instructions:
1) All Questions are Compulsory.
2) Draw neat diagrams.
3)Assume suitable data if necessary.

Question No.	Section B	Max. Marks
Q 4	**Attempt any four.** i) Explain Select and Project operations in Relational Algebra with suitable syntax and example. - Select operation (2.5 M) and Project operation (2.5 M). ii) What is Normalization ? Explain with example requirements of Boyce Codd Normal Form (BCNF) - Normalization definition (2M) and BCNF (3M). iii) Explain different features of good relational database design. iv) Describe the difference between static hashing and dynamic hashing with example. - Static hashing (2.5 M) and dynamic hashing (2.5 M). v) Explain in brief with suitable example Full functional dependency & partial dependency. - Full functional dependency (2.5 M) and partial dependency (2.5 M). vi) Define Indexing. Describe Primary indexing with suitable structure. - Indexing Definition (2M) and Primary indexing (3M).	20 M
Q 5	**Attempt any four.** i) Describe the significance of Thomas write rule in concurrency control process. ii) Explain the recovery process using log based. iii) Draw and explain State diagram of Transaction. iv) Describe Shadow paging v) Show how Deadlock is handled with wait for graph. vi) Write a note on recoverable and cascadeless schedule. Justify your answer with valid example.	20 M
Q 6	**Attempt the following. (2M for each question)** 1) A database of research articles in a journal uses the following schema. (volume, number, startpage, endpage, title, year, price) The primary key is (volume, number, startpage, endpage) and the following functional dependencies exist in the schema. (volume, number, startpage, endpage) -> title (volume, number) -> year (volume, number, startpage, endpage) -> price	10 M

The database is redesigned to use the following schemas.
(volume, number, startpage, endpage, title, price)
(volume, number, year)
Which is the weakest normal form that the new database satisfies, but the old one does not?
Options-
i) 1NF
ii) 2NF
iii) 3NF
iv) BCNF

2) Let the set of functional dependencies F= {QR→S, R→P, S→Q} hold on a relation schema X = (PQRS). X is not in BCNF. Suppose X is decomposed into two schemas Y and Z, where Y = (PR) and Z = (QRS).
Consider the two statements given below.
I. Both Y and Z are in BCNF.
II. Decomposition of X into Y and Z is dependency preserving and lossless.
Which of the above statements is/are correct?
Options-
i) Both I and II
ii) I only
iii) II only
iv) Neither I nor II

3) Consider a relation R = {ABCDEG} with the following set of dependencies:
AB→C
AC→B
AD→E
B→D
BC→A
E→G
Then the decomposition (ABC, ACDE, ADG) is
Options-
i) lossless but not dependency preserving
ii) dependency preserving but not lossless
iii) lossless and dependency preserving
iv) neither lossless nor dependency preserving

4) A table has fields F1, F2, F3, F4, and F5, with the following functional dependencies:
F1→F3
F2→F4
(F1, F2) → F5
in terms of normalization, this table is in
Options-
i)1NF
ii)2NF
iii)3NF
iv) None of the mentioned

5) Assume that we have a relation R(A, B, C, D, E) with a multi-valued dependency A →→BC (A multi-determines BC). Which of the following statements are correct?

	Options- i) For a given A, the values of BC and DE are dependent of each other. ii) For a given A, the values of BC and DE are independent of each other iii) The values of BC can determine that of DE iv) The values of DE can determine that of BC	

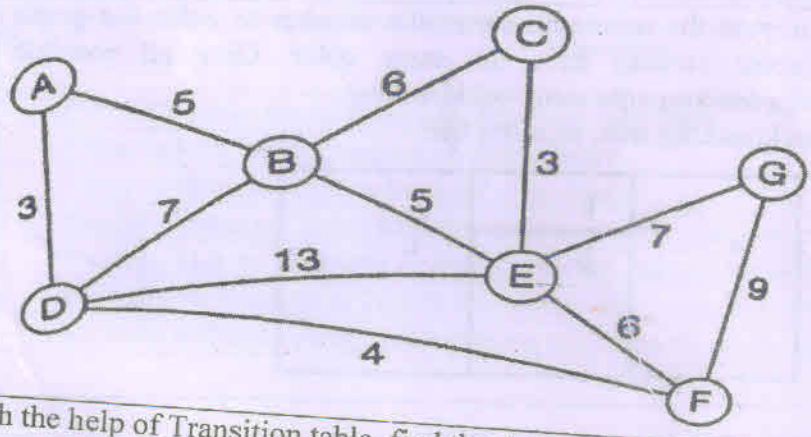
24.05.2023(E)

SOMAIYA VIDYAVIHAR UNIVERSITY

Maximum Marks: 100	Semester: May 2023 – June 2023 Examination: ESE Examination	Duration:3 Hrs.
Programme code: 01		
Programme: Computer	Class: SY	Semester: (SVU 2020)
Name of the Constituent College: K. J. Somaiya College of Engineering	Name of the department: Computer	
Course Code: 116U01C402	Name of the Course: Analysis of Algorithms	

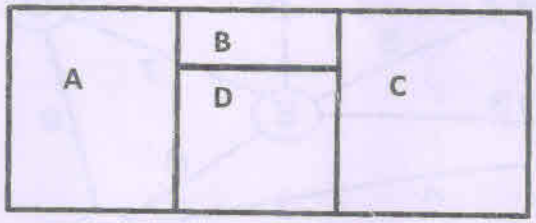
Instructions: 1)Draw neat diagrams 2) All questions are compulsory 3) Assume suitable data wherever necessary

Que. No.	Question	Max. Marks
Q1	Solve any **Four**	20
i)	Explain Growth of a function with the help of a graph	5
ii)	Give difference between Algorithm and Program	5
iii)	Explain the Control abstraction of divide and conquer algorithm.	5
iv)	Which are the different methods of solving recurrence? Explain any one with example.	5
v)	What are the constraints that must be satisfied while solving any problem using backtracking?	5
vi)	Compare Backtracking and Branch and Bound Algorithm techniques	5

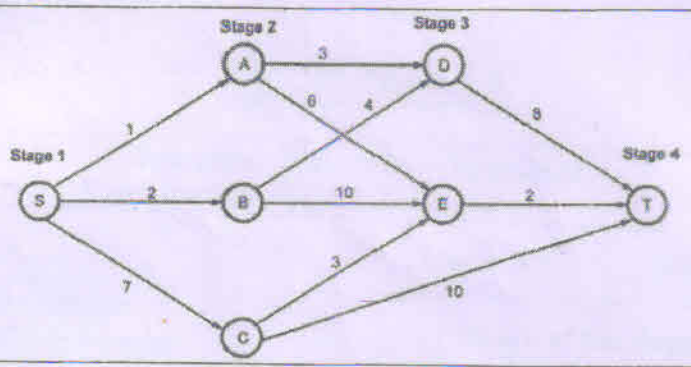
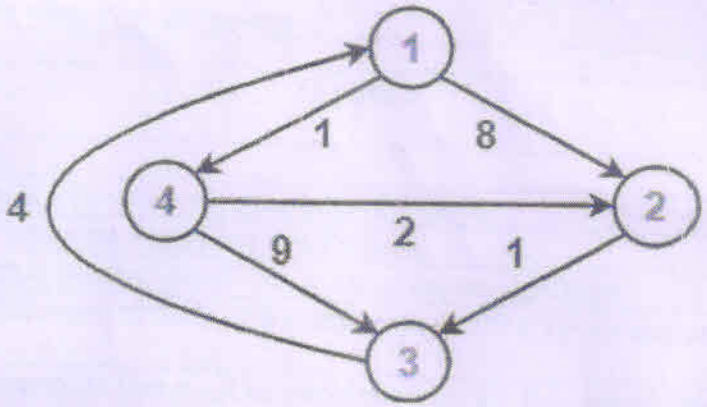
Que. No.	Question	Max. Marks
Q2 A	Solve the following	10
i)	Find the MST for the given graph using Kruskal algorithm  	5
ii)	With the help of Transition table, find the Automata for the given Pattern P. P=acacaga	5
	OR	
Q2 A	Solve 8 -puzzle problem for the given initial and goal state using branch and bound strategy Initial: (1 3 / 4 2 5 / 7 8 6) Goal: (1 2 3 / 4 5 6 / 7 8)	10

Q 2 B	Solve any **One**	
i)	Find all the subsets of the given weight vector w = {5, 11, 13, 24} having required sum M = 29 using backtracking method.	
ii)	Prince, the jewel thief wants to rob a jewellers shop. He can carry weight up to 10kg only Without getting caught. Using dynamic programming approach, help him choose the box of jewels so as to have a most profitable robbery. The weight and profit of the jewel boxes is as follows. **(Boxes are packed and it will be risky to open during stealing them)**	10

Box of Jewel	**Pearl**	**Ruby**	**Topaz**	**Emerald**	**Diamond**	**Gold**
Weight (in kg.)	2	4	3	6	5	2
Profit	3	12	5	60	14	4

Que. No.	**Question**	**Max. Marks**
Q3	Solve any **Two**	**20**
i)	Solve Matrix Chain Multiplication for the order <4,10,3,12,20>	10
ii)	Define Longest Common Subsequence Problem. Give Dynamic Programming Solution for the given instance of problem. X= Notebook Y= Facebook To solve the same, 1. Write Recursive formula 2. Solve by Table formulation and Compute the answer 3. Compute the Longest Common Subsequence with length	10
iii)	For the given graph, compute the minimum chromatic number to color the graph such that no two adjacent vertices have the same color. Give all possible combinations of such color assignments using backtracking. Draw state space tree, backtracking tree, solution tree.  	10

Que. No.	**Question**	**Max. Marks**
Q4	**Solve any Two**	**20**
i)	Solve the given problem instance of Multistage graphs with forward or backward (either of the methods) To solve the same, a) Write the recursive formula b) Compute the answer c) Construct the answer	10

		
ii)	For Given graph, apply Floyd Warshall's Algorithm to compute all pairs shortest distance. Show all steps 	10
iii)	Write down algorithms for merge sort. Sort the following list of elements in ascending order using Merge sort technique. 27 10 12 20 25 13 55 22 Also compute complexity of the algorithm using Master theorem and Recursion tree method.	10

Que. No.	Question	Max. Marks
Q5	**(Write notes / Short question type) on any four**	**20**
i)	What is NP Completeness and reducibility	5
ii)	Write short note on Randomised Algorithm	5
iii)	Explain Dynamic programming technique with suitable example	5
iv)	Explain Master Theorem in detail with the help of suitable example	5
v)	Explain the concept of Naïve string matching with the help of suitable example	5
vi)	Explain different complexity classes with suitable examples	5

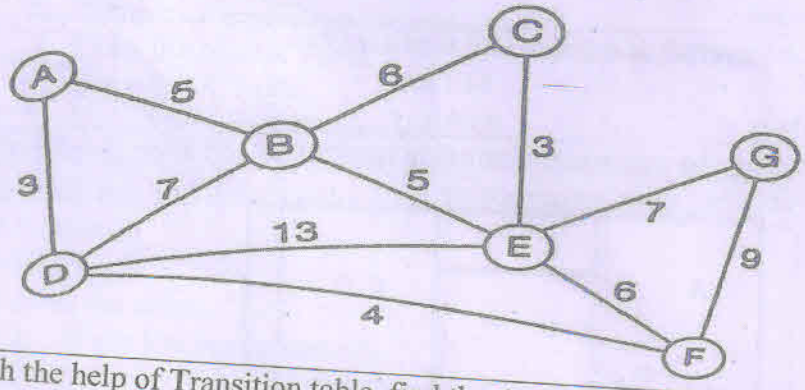
SOMAIYA VIDYAVIHAR UNIVERSITY

24.05.2023(E)

Maximum Marks: 100	Semester: May 2023 – June 2023 Examination: ESE Examination		Duration:3 Hrs.
Programme code: 01 Programme: Computer		Class: SY	Semester: (SVU 2020)
Name of the Constituent College: K. J. Somaiya College of Engineering		Name of the department: Computer	
Course Code: 116U01C402	Name of the Course: Analysis of Algorithms (PWD Section A)		

Instructions: 1)Draw neat diagrams 2) All questions are compulsory
3) Assume suitable data wherever necessary

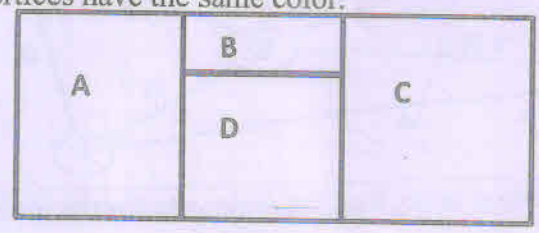
Que. No.	Question	Max. Marks
Q1	Solve any **Four**	20
i)	Explain Growth of a function with the help of a graph	5
ii)	Give difference between Algorithm and Program	5
iii)	Explain the Control abstraction of divide and conquer algorithm.	5
iv)	Which are the different methods of solving recurrence? Explain any one with example.	5
v)	What are the constraints that must be satisfied while solving any problem using backtracking?	5
vi)	Compare Backtracking and Branch and Bound Algorithm techniques	5

Que. No.	Question	Max. Marks
Q2 A	Solve the following	10
i)	Find the MST for the given graph using Kruskal algorithm  	5
ii)	With the help of Transition table, find the Automata for the given Pattern P. P=acacaga	5
	OR	
Q2 A	Solve 8 -puzzle problem for the given initial and goal state using branch and bound strategy Initial: (1 3; 4 2 5; 7 8 6) Goal: (1 2 3; 4 5 6; 7 8) 1. Explain Branch and Bound Techniques 2. Write the formula for estimated minimum cost to reach the goal node. 3. Draw the space tree with estimated minimum cost at each stage	10

2 B	Solve any **One**	
i)	Find all the subsets of the given weight vector w = {5, 11, 13, 24} having required sum M = 29 using backtracking method. 1. Explain Backtracking Techniques 2. Write the formulas for the given problem. 3. Draw the space tree with for the given problem.	
ii)	Prince, the jewel thief wants to rob a jewellers shop. He can carry weight up to 10kg only Without getting caught. Using dynamic programming approach, help him choose the box of jewels so as to have a most profitable robbery. The weight and profit of the jewel boxes is as follows. **(Boxes are packed and it will be risky to open during stealing them)**	10

Box of Jewel	Pearl	Ruby	Topaz	Emerald	Diamond	Gold
Weight (in kg.)	2	4	3	6	5	2
Profit	3	12	5	60	14	4

1. Explain which algorithm is applicable for the said problem
2. With the help of table solve the given problem
3. Give the optimal solution for the same

Que. No.	Question	Max. Marks
Q3a)		10
i)	An algorithm which uses the past results and uses them to find the new results is a) Brute Force b) Divide and Conquer c) Dynamic programming algorithms d) None of the mentioned	2
ii)	The Depth First Search traversal of a graph will result into? a) Linked List b) Tree c) Graph with back edges d) Array	2
iii)	For the given graph, select the minimum chromatic number to color the graph such that no two adjacent vertices have the same color.  a) One b) Two c) Three d) Four	2
iv)	Fractional knapsack problem is solved most efficiently by which of the following algorithm? a) Divide and conquer b) Dynamic programming c) Greedy algorithm d) Backtracking	2
v)	Every graph has only one minimum spanning tree. a) True b) False	2

SOMAIYA VIDYAVIHAR UNIVERSITY

24.05.2023 (E)

Semester: May 2023 – June 2023 Maximum Marks: 100 Examination: ESE Examination		Duration:3 Hrs.
Programme code: 01 Programme: Computer	Class: SY	Semester: (SVU 2020)
Name of the Constituent College: K. J. Somaiya College of Engineering	Name of the department: Computer	
Course Code: 116U01C402	Name of the Course: Analysis of Algorithms (PWD Section B)	
Instructions: 1)Draw neat diagrams 2) All questions are compulsory 3) Assume suitable data wherever necessary		

Que. No.	Question	Max. Marks
Q4	Solve any **Four**	20
i)	What is NP Completeness and reducibility	5
ii)	Write short note on Randomised Algorithm	5
iii)	Explain Dynamic programming technique with suitable example	5
iv)	Explain Master Theorem in detail with the help of suitable example	5
v)	Explain the concept of Naïve string matching with the help of suitable example	5
vi)	Explain different complexity classes with suitable examples	5

Que. No.	Question	Max. Marks
Q5	Solve any **Two**	20
i)	Solve Matrix Chain Multiplication for the order < 4,10,3,12> 1. Write Recursive formula 2. Compute the solution stage wise 3. Draw the Matrix Table 4. Draw the K Table 5. Obtain the optimal solution	10
ii)	Define Longest Common Subsequence Problem. Give Dynamic Programming Solution for the given instance of problem. X= Notebook Y= Facebook To solve the same, 1. Write Recursive formula 2. Solve by Table formulation and Compute the answer 3. Compute the Longest Common Subsequence with length	10
iii)	1. Write down algorithms for merge sort. 2. Sort the following list of elements in ascending order using Merge sort technique. 27 10 12 20 25 13 55 22 3. Also compute complexity of the algorithm using Master theorem and Recursion tree method.	10

SOMAIYA VIDYAVIHAR UNIVERSITY

24.05.2023 (E)

Semester: May 2023 – June 2023 Maximum Marks: 100 Examination: ESE Examination		Duration:3 Hrs.
Programme code: 01 Programme: Computer	Class: SY	Semester: (SVU 2020)
Name of the Constituent College: K. J. Somaiya College of Engineering	Name of the department: Computer	
Course Code: 116U01C402	Name of the Course: Analysis of Algorithms (PWD Section B)	
Instructions: 1)Draw neat diagrams 2) All questions are compulsory 3) Assume suitable data wherever necessary		

Que. No.	Question	Max. Marks
Q4	Solve any **Four**	20
i)	What is NP Completeness and reducibility	5
ii)	Write short note on Randomised Algorithm	5
iii)	Explain Dynamic programming technique with suitable example	5
iv)	Explain Master Theorem in detail with the help of suitable example	5
v)	Explain the concept of Naïve string matching with the help of suitable example	5
vi)	Explain different complexity classes with suitable examples	5

Que. No.	Question	Max. Marks
Q5	Solve any **Two**	20
i)	Solve Matrix Chain Multiplication for the order < 4,10,3,12> 1. Write Recursive formula 2. Compute the solution stage wise 3. Draw the Matrix Table 4. Draw the K Table 5. Obtain the optimal solution	10
ii)	Define Longest Common Subsequence Problem. Give Dynamic Programming Solution for the given instance of problem. X= Notebook Y= Facebook To solve the same, 1. Write Recursive formula 2. Solve by Table formulation and Compute the answer 3. Compute the Longest Common Subsequence with length	10
iii)	1. Write down algorithms for merge sort. 2. Sort the following list of elements in ascending order using Merge sort technique. 27 10 12 20 25 13 55 22 3. Also compute complexity of the algorithm using Master theorem and Recursion tree method.	10

Que. No.	Question	Max. Marks
Q3 b)		20
i)	The algorithms like merge sort, quick sort and binary search are based on _____ Greedy Technique Divide and Conquer algorithm Dynamic Technique Backtracking Technique	2
ii)	An Algorithm is _____ a) A procedure for solving a problem b) A problem c) A real-life mathematical problem d) None of the mentioned	2
iii)	Which of the following branch and bound strategy leads to breadth first search? a) LIFO branch and bound b) FIFO branch and bound c) Lowest cost branch and bound d) Highest cost branch and bound	2
iv)	The longest increasing subsequence problem is a problem to find the length of a subsequence from a sequence of array elements such that the subsequence is sorted in increasing order and it's length is maximum. This problem can be solved using _____ a) Recursion b) Dynamic programming c) Brute force d) Recursion, Dynamic programming, Brute force	2
v)	For any given sequence, there will ALWAYS be a unique increasing subsequence with the longest length. a) True b) False	2