

14/6/2023 (E)

Maximum Marks: 100	Semester: August 2022 – December 2022 Examination: ESE Examination KT May 23 Duration: 3 Hrs.	
Programme code: 01	Class: SY	Semester: III(SVU 2020)
Programme: B.TECH Computer Engineering		
Name of the Constituent College: K. J. Somaiya College of Engineering		Name of the department: COMP
Course Code: 116U01C305	Name of the Course: Discrete Mathematics	
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 power set? How many elements are there in any power set in general? Find the power set of the set $A = \{\alpha, \beta, \gamma\}$	5
ii)	Define tautology and contradiction Determine whether $P \vee \neg P$ is a tautology or contradiction.	5
iii)	Define an equivalence relation. Let $A = \{1, 2, 3, 4\}$ and let $R = \{(1, 1), (1, 2), (2, 1), (2, 2), (3, 4), (4, 3), (3, 3), (4, 4)\}$ Is R an equivalence relation?	5
iv)	Draw Hasse diagram for the following relations on set $A = \{1, 2, 3, 4, 12\}$ $R = \{(1, 1), (2, 2), (3, 3), (4, 4), (12, 12), (1, 2), (4, 12), (1, 3), (1, 4), (1, 12), (2, 4), (2, 12), (3, 12)\}$	5
v)	Consider the above function $f(x) = 2x - 3$. Find a formula for the composition functions (i) $f^2 = f \circ f$ and (ii) $f^3 = f \circ f \circ f$.	5
vi)	Define Hamiltonian path and circuit in a graph. Write a Hamiltonian path and a circuit for the graph shown below:	5



Que. No.	Question	Max. Marks
Q2 A	Solve the following	10
i)	Prove that for any positive integer number n, $n^2 + 2n$ is divisible by 3, for all $n \geq 1$. (use mathematical induction)	5
ii)	Find the DNF of : $(p \vee q) \rightarrow r$ (Using laws of logic or using truth table).	5
	OR	
Q2 A	Suppose that 100 of the 120 mathematics students at a college take at least one of the languages French, German and Russian. Also suppose 65 study French, 45 study German, 42 study Russian, 20 study French and German, 25 study French and Russian, 15 study German and Russian . (a) Find the number of students studying all three languages (b) Find correct number of students in each of the 8 regions of Venn diagram. (here F, G, R denotes the sets of the students who study all three languages)	10

	(c) Determine the number k of students who study (i) exactly one language (ii) exactly two languages	
Q 2 B	Solve any One	
i)	What is Warshall's algorithm? Let $A = \{1, 2, 3, 4\}$ and let $R = \{(1, 2), (2, 3), (3, 4), (2, 1)\}$. Find transitive closure of R using Warshall's algorithm.	10 10
ii)	Let $A = \{a, b, c, d\}$ and R be a relation on A whose matrix is $M_R = \begin{bmatrix} 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & 1 \\ 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 \end{bmatrix}$ (i) Prove that R is partial order. (ii) Draw Hasse diagram of R .	10 10

Que. No.	Question	Max. Marks
Q3	Solve any Two	20 10
i)	State the pigeonhole principle and the extended pigeonhole principle. What is the minimum number of students required in a discrete structures class to be sure that at least six will receive the same grade, if there are five possible grades A, B, C, D, E.	10
ii)	What is a Lattice? Show that the set of all divisors of 70 forms a lattice.	10
iii)	Define an edge with respect to a graph. State Handshaking Lemma with its equation. How many nodes are necessary to construct a graph with exactly 6 edges in which each node is of degree 2.	10
Que. No.	Question	Max. Marks
Q4	Solve any Two	20 10
i)	Write the definition of a graph. What are isomorphic graphs? Determine whether the below mentioned graphs are isomorphic.	10
ii)	Obtain the addition modulo 6 group, table of Z_6 . Let $H = \{[0]_6, [3]_6\}$. Find the left and right cosets in group Z_6 . Is H normal subgroup of Z_6 ?	10
iii)	Define Hamming distance. How many errors can be detected and corrected in Hamming code if d is the minimum distance between the code words? Consider the $(2, 4)$ encoding function. How many errors will be detect? $e(00) = 0000 \quad e(10) = 0110$ $e(01) = 1011 \quad e(11) = 1100$	10

Que. No.	Question	Max. Marks
----------	----------	------------

	(c) Determine the number k of students who study (i) exactly one language (ii) exactly two languages	
Q 2 B	Solve any One	
i)	What is Warshall's algorithm? Let $A = \{1, 2, 3, 4\}$ and let $R = \{(1, 2), (2, 3), (3, 4), (2, 1)\}$. Find transitive closure of R using Warshall's algorithm.	10 10

ii) Let $A = \{a, b, c, d\}$ and R be a relation on A whose matrix is

$$M_R = \begin{bmatrix} 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & 1 \\ 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

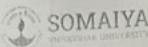
- (i) Prove that R is partial order.
 (ii) Draw Hasse diagram of R .

Que. No.	Question	Max. Marks
Q3		
i)	Solve any Two State the pigeonhole principle and the extended pigeonhole principle. What is the minimum number of students required in a discrete structures class to be sure that at least six will receive the same grade, if there are five possible grades A, B, C, D, E.	20 10
ii)	What is a Lattice? Show that the set of all divisors of 70 forms a lattice.	10
iii)	Define an edge with respect to a graph. State Handshaking Lemma with its equation. How many nodes are necessary to construct a graph with exactly 6 edges in which each node is of degree 2.	10
Que. No.	Question	Max. Marks
Q4		
i)	Solve any Two Write the definition of a graph. What are isomorphic graphs? Determine whether the below mentioned graphs are isomorphic.	20 10
ii)	Obtain the addition modulo 6 group, table of Z_6 . Let $H = \{[0]_6, [3]_6\}$. Find the left and right cosets in group Z_6 . Is H normal subgroup of Z_6 ?	10
iii)	Define Hamming distance. How many errors can be detected and corrected in Hamming code if d is the minimum distance between the code words? Consider the $(2, 4)$ encoding function. How many errors will be detect? $e(00) = 0000 \quad e(10) = 0110$ $e(01) = 1011 \quad e(11) = 1100$	10

Que. No.	Question	Max. Marks
Q5	Solve any four	20
i)	Write the following two propositions in symbols:	5

	Let $p(x,y)$ denote the predicate ' $y = x + 1$ '.	
(i)	'For every number x there is a number y such that $y = x + 1$.'	
(ii)	'There is a number y such that, for every number x , $y = x + 1$.'	
ii)	Construct the truth table for the following compound proposition $\sim P \wedge (P \rightarrow Q)$	5
iii)	Identify the greatest and the least element in the following structures:	5
		
	Figure 1	
		
	Figure 2	
iv)	Let $A = \{0, -1, 1\}$ and $B = \{0, 1\}$. Let $f: A \rightarrow B$ where $f(a) = a $. Is f onto?	5
v)	What is multigraph, subgraph and spanning subgraph?	5
vi)	Define a group and an abelian group. Is a set of all non zero real numbers a group with respect to multiplication?	5

16.6.2023 (E)



Maximum Marks: 100	Semester: August 2022 – December 2022 Examination: ESE Examination May 2023 Duration: 3 Hrs.
Programme code: : 75 Programme: Minor in Computer Engineering	Class: SY Semester: III(SVU 2020)
Name of the Constituent College: K. J. Somaiya College of Engineering	Name of the Department: Computer Engineering
Course Code: 116m75C301	Name of the Course: Database Management System
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)	list different users of DBMS	5
ii)	Give example for Weak and Strong Entity	5
iii)	Explain primary, foreign key and candidate key with an example	5
iv)	Define 1NF, 2NF and 3NF	5
v)	Which are the Desirable properties of Transaction explain any 2 properties.	5
vi)	Explain Hashing with example	5

Que. No.	Question	Max. Marks
Q2 A	Solve the following	10
i)	Explain types of data independence	5
ii)	List all the steps used for mapping EER Model to Relational Model	5
OR		
Q2 A	Explain the DBMS architecture with diagram	10
Q2 B	Solve any One	10
i)	Explain the Characteristics of databases	10
ii)	Draw Enhanced-Entity-Relationship (EER)- Model to represent Generalization, Specialization and Recursive relation w.r.t Employee database	10

Que. No.	Question	Max. Marks
Q3	Solve any Two	20
i)	write SQL queries to perform union operation and aggregate functions on Railway database	10
ii)	Explain Relational algebra operations :-Selection , Projection and Set operations w.r.t Railway database	10
iii)	Why Indexing is used, Explain multilevel indices, secondary indices with example	10

Que. No.	Question	Max Marks
Q4	<p>Solve any Two</p> <p>i) For the relational schema $R(A,B,C,D,E,F)$ having functional dependencies $A \rightarrow BC$, $CD \rightarrow E$, $B \rightarrow D$, $E \rightarrow AF$. List the candidate keys of R</p> <p>ii) If the above schema $r(A,B,C,D,E,F)$ is decomposed into $r1(A,B,C)$, $r2(A,D,E,F)$. Show that this decomposition is a lossless decomposition assuming same set of functional dependencies holds</p>	
	<p>iii) Consider the three transactions $T1$, $T2$, $T3$ and the schedules S.</p> <ol style="list-style-type: none"> State whether schedule is conflict serializable or not. If a schedule is conflict serializable, write down the equivalent conflict serializable schedule <p>$T1: r1(X); r1(Z); w1(X);$ $T2: r2(Z); r2(Y); w2(Z); w2(Y);$ $T3: r3(X); r3(Y); w3(Y);$ $S: r1(X); r2(Z); r1(Z); r3(X); r3(Y); w1(X); w3(Y); r2(Y); w2(Z); w2(Y);$</p>	
Q5	<p>(Write notes / Short question type) on any four</p> <p>i) Compare File system and Database approach</p> <p>ii) Advantages of the Relational Model</p> <p>iii) Views in SQL with example</p> <p>iv) Transaction states with Diagram</p> <p>v) Need for Normalization of database</p> <p>vi) Steps involved in query processing with diagram</p>	20 5 5 5 5 5

2 - 6 - 2023 (E)



Semester: January 2023– May 2023
Examination: ESE Examination

Duration: 3 hrs

Maximum Marks: 100	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 are 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																																	
OR																																			
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																																	
Q2 A	Explain characteristics of Big data w.r.t WhatsApp Application	10																																	
Q2 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																																	
	<table border="1"> <thead> <tr> <th>Instances</th> <th>True class</th> <th>$P(+ A, \dots, Z, M_1)$</th> </tr> </thead> <tbody> <tr><td>1</td><td>+</td><td>0.73</td></tr> <tr><td>2</td><td>+</td><td>0.69</td></tr> <tr><td>3</td><td>-</td><td>0.44</td></tr> <tr><td>4</td><td>-</td><td>0.55</td></tr> <tr><td>5</td><td>+</td><td>0.67</td></tr> <tr><td>6</td><td>+</td><td>0.47</td></tr> <tr><td>7</td><td>-</td><td>0.08</td></tr> <tr><td>8</td><td>-</td><td>0.15</td></tr> <tr><td>9</td><td>+</td><td>0.45</td></tr> <tr><td>10</td><td>-</td><td>0.35</td></tr> </tbody> </table> b. Give the different measures of central tendency for numerical data. Which is the robust measure? Why?	Instances	True class	$P(+ A, \dots, Z, M_1)$	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	
Instances	True class	$P(+ A, \dots, Z, M_1)$																																	
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																																	

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

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
Q3	Solve any Two
i)	For which type of data analysis following graphs are use <ul style="list-style-type: none"> - Histogram - Scatter plot - Box plot
ii)	Explain with proper example
iii)	Why Pre-processing of data is required ? Explain any 3 pre-processing method with example
	Explain The Data Science Process on Hospital Management data

Que. No.	Question
Q4	Solve any Two
i)	<p>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 k-means (atleast 3 iteration)</p> <p>b. Compare k-Nearest Neighbours(k-NN) and k-means algorithms</p>

Sr No.
0
1
2
3
4
5
6
7
8
9
10
11
12
13

Using the following

No.
1
2
3
4
5
6
7
8
9
10
11
12
13

Que. No.	(Write notes What Skill
Q5	
i)	
ii)	Feature Sel
iii)	Is Random
iv)	Kurtios

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	
i)	What Skill sets are needed for Applied Data Science	20
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



26.05.2023 (E)

Semester: January 2023– May 2023

Marks: 50

Examination: ESE Examination

Duration: 3 hrs

Code: 01

Name: B.Tech Computer Engineering

Class: SY

Semester: IV (SVU 2020)

Constituent College:

Somaiya College of Engineering

Name of the department: COMP

Code: 116U01C403

Name of the Course: Relational Database Management System

Instructions:

Questions are Compulsory.

Draw neat diagrams.

Use suitable data if necessary.

Q 1

Section A

Max. Marks

Attempt any four.

- List and explain the various users of database and their roles.
- Describe different applications of database.
- State and explain concerns while using an enterprise database.
- State the difference between physical data independence and logical data independence.
- Explain the role of database administrator.
- State characteristics of Database System.

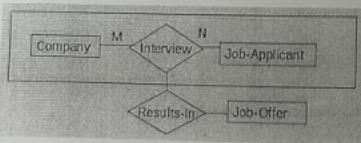
20 M

Q 2

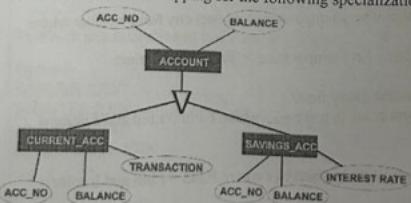
Attempt any four from the following

- Explain the distinction between disjoint and overlapping constraints.
- Show the relational mapping for the following. consider any attributes for entity shown in the diagram.

20 M



- Explain aggregate functions in SQL with syntax and example.
- Describe security mechanism in SQL.
- Show the relational mapping for the following specialization:



26.05.2023 (E)



SOMAIYA
VIDYAVAHAN UNIVERSITY

Maximum Marks: 100	Semester: January 2023 – May 2023	Duration: 3 Hrs.
Programme code: 01	Examination: ESE Examination	
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	
i)	Explain the different types of users who play different role in DBMS.	10
ii)	Compare File system and DBMS.	5
	OR	
Q2 A	Explain types of data model.	
Q2 B	Solve any One	10
i)	What is relational algebra? Explain the basic operations in relational algebra.	10
ii)	Write the differences between DDL and DML commands.	10

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

Question

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

Question

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

Programme code: 01	Examination: ESE Examination	Duration: 3 hrs
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	<p>Attempt any four.</p> <ol style="list-style-type: none"> List and explain the various users of database and their roles. Describe different applications of database. State and explain concerns while using an enterprise database. State the difference between physical data independence and logical data independence. Explain the role of database administrator. State characteristics of Database System. 	20 M
Q 2	<p>Attempt any four from the following</p> <ol style="list-style-type: none"> Explain the distinction between disjoint and overlapping constraints. Show the relational mapping for the following consider any attributes for entity shown in the diagram. <pre> graph LR Company[M Company] -- M --> Interview{Interview} Interview -- N --> JobApplicant[Job-Applicant] Interview -- N --> Results{Results} Interview -- N --> JobOffer[Job-Offer] JobApplicant --- JobOffer Results --- JobOffer </pre> <ol style="list-style-type: none"> Explain aggregate functions in SQL with syntax and example. Explain security mechanism in SQL. Describe security mechanism in SQL. Show the relational mapping for the following specialization: <p>v) Show the relational mapping for the following specialization:</p> <pre> graph TD ACCOUNT[ACCOUNT
ACC_NO] --> SAVINGS[SAVINGS ACC
ACC_NO, INTEREST RATE] ACCOUNT --> CURRENT[CURRENT ACC
ACC_NO, BALANCE] ACCOUNT --> TRANSACTION[TRANSACTION
ACC_NO, BALANCE] </pre>	20 M

1/4

- vi) Write a note on total participation and partial participation. Give suitable example.

Q.3 i) Given the following statements:
 SI: 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 INTGER, d INTGER, e INTGER, 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 -

16)

i) Find the suitable boats
ii) Find the green boats
iii) Find the green boats
iv) None of the above

A	14	ham
	13	Amur
	12	Siberia
	11	Balikesir
	99	

How many tables are there?

Select A,Id = ?

'Arun')

Options -

- i) 4
- ii) 3
- iii) 0
- iv) 1

6) A command

Options -

- i) Delete table
- ii) Drop table
- iii) Erase table
- iv) Alter table

7) The CREATE

clause specifies

Options -

- i) for instance
- ii) on, for
- iii) for,
- iv) both

8) Which of the following is true?

Options -

- i) INN
- ii) OR
- iii) C
- iv) N

9) Error

- 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 almost 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			B			C		
<u>Id</u>	Name	Age	<u>Id</u>	Name	Age	<u>Id</u>	Phone	Area
12	Arun	60	13	Shreya	34	10	2200	02
15	Shreya	24	25	Hari	40	99	2169	01
39	Rohit	11	98	Rohit	20			
			99	Rohit	11			

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:

3/4

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 its query.
- iii) The performance of the view degrades if they are based on other views.
- iv) Only option to safeguard data integrity.

Maximum Marks: 50 Semester: January 2023– May 2023

Programme code: 01 Examination: ESE Examination

Programme: B.Tech Computer Engineering Duration: 3 hrs

Name of the Constituent College: Class: SY Semester: IV (SVU 2020)

K. J. Somaiya College of Engineering Name of the department: COMP

Course Code: 1161U01C403 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. <ul style="list-style-type: none"> 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. <ul style="list-style-type: none"> 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) <ul style="list-style-type: none"> I) 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. $(volume, number, startpage, endpage) \rightarrow title$ $(volume, number) \rightarrow year$ $(volume, number, startpage, endpage) \rightarrow price$ 	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 $F = \{QR \rightarrow S, R \rightarrow P, S \rightarrow Q\}$ 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 \rightarrow C

AC \rightarrow B

AD \rightarrow E

B \rightarrow D

BC \rightarrow A

E \rightarrow 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 \rightarrow F3

F2 \rightarrow F4

(F1, F2) \rightarrow 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 $A \rightarrow\!\! \rightarrow BC$ (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

Maximum Marks: 100 Semester: May 2023 – June 2023
Programme code: 01 Examination: ESE Examination
Programme: Computer Duration: 3 Hrs.

Name of the Constituent College: Class: SY Semester: (SVU 2020)

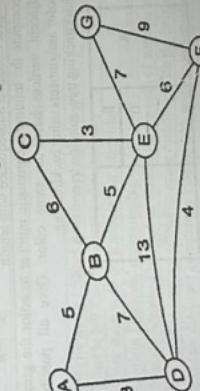
K. J. Somaiya College of Engineering Course Code: 116U01C402 Name of the department: Computer

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	
i)	Explain Growth of a function with the help of a graph	20
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	
i)	Find the MST for the given graph using Kruskal algorithm	10
ii)	With the help of Transition table, find the Automata for the given Pattern P. $P = \text{acaca}ga$	5
OR		
Q2 A	Solve 8-puzzle problem for the given initial and goal state using branch and bound strategy	10

1/3



Initial	<table border="1"><tr><td>1</td><td>2</td><td>3</td></tr><tr><td>4</td><td>5</td><td>6</td></tr><tr><td>7</td><td>8</td><td>6</td></tr></table>	1	2	3	4	5	6	7	8	6
1	2	3								
4	5	6								
7	8	6								
Goal	<table border="1"><tr><td>1</td><td>2</td><td>3</td></tr><tr><td>4</td><td>5</td><td>6</td></tr><tr><td>7</td><td>8</td><td>9</td></tr></table>	1	2	3	4	5	6	7	8	9
1	2	3								
4	5	6								
7	8	9								

Q2 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) The jewel thief wants to rob a jewellers shop. He can carry weight up to l_{max} 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)

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

Q3

Solve any Two

- i) Solve Matrix Chain Multiplication for the order $<4, 10, 3, 12, 20>$

- ii) Define Longest Common Subsequence Problem. Give Dynamic Programming Solution for the given instance of problem.

X= Notebook

Y= Facebook

To solve the same,

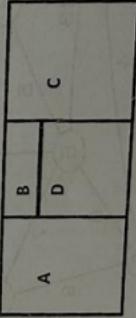
1. Write Recursive formula

2. Solve by Table formulation and Compute the answer

3. Compute the Longest Common Subsequence with length

- 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.



Q4

Solve any Two

- i) Solve the given problem instance of Multistage graphs with forward or backward

To solve the same,

- a) Write the recursive formula

- b) Compute the answer

- c) Construct the answer

Question

No.

Q3

Solve any Two

- i) Solve Matrix Chain Multiplication for the order $<4, 10, 3, 12, 20>$

- 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

- 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.

Question

No.

Q4

Solve any Two

- i) Solve the given problem instance of Multistage graphs with forward or backward

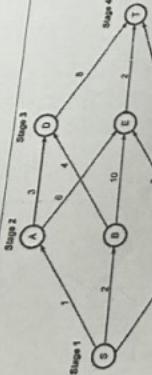
To solve the same,

- a) Write the recursive formula

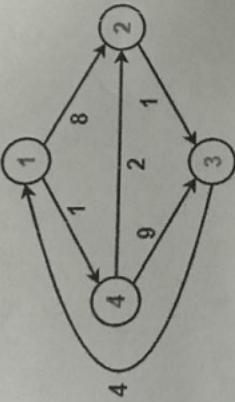
- b) Compute the answer

- c) Construct the answer

having required
right up to 10Kg
help him
be risky to



- ii) For Given graph, apply Floyd Warshall's Algorithm to compute all pairs shortest distance. Show all steps



- iii) Write down algorithms for merge sort.
Sort the following list of elements in ascending order using Merge sort technique.
Also compute complexity of the algorithm using Master theorem and Recursion tree method.

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 Naive string matching with the help of suitable examples	5
vi)	Explain different complexity classes with suitable examples	5

{5, 11, 13, 24} having required



24.05.2023 (E)

He can carry weight up to 10kg
mining approach, help him
le robbery. The weight and
ded and it will be risky to

Gold	2
	2

and the new results is	2
	2

color the graph such	2
	2

of the following

Maximum Marks: 100		Semester: May 2023 – June 2023		Duration: 3 Hrs.		
Programme code: 01		Examination: ESE Examination		Semester: SY		
Programme: Computer		Name of the Constituent College:		Name of the department: Computer		
K. J. Somaiya College of Engineering		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	Que. No.	Question	Max. Marks	
Q4	Solve any Four	20	Q4	Solve any Two	20	
i)	What is NP Completeness and reducibility	5	i)	Solve Matrix Chain Multiplication for the order	5	
ii)	Write short note on Randomised Algorithm	5	ii)	<4,10,3,12>	5	
iii)	Explain Dynamic programming technique with suitable example	5	iii)	1. Write Recursive formula	5	
iv)	Explain Master Theorem in detail with the help of suitable example	5	iv)	2. Compute the solution stage wise	5	
v)	Explain the concept of Native string matching with the help of suitable example	5	v)	3. Draw the Matrix Table	5	
vi)	Explain different complexity classes with suitable examples	5	vi)	4. Draw the K Table	5	
				5. Obtain the optimal solution	5	
Max. Marks	Que. No.	Question	Max. Marks	Que. No.	Question	
10	Q5	Solve Matrix Chain Multiplication for the order	10	Q5	Solve any Two	20
2	i)	<4,10,3,12>	10	i)	1. Write Recursive formula	5
				ii)	2. Compute the solution stage wise	5
				iii)	3. Draw the Matrix Table	5
				iv)	4. Draw the K Table	5
				v)	5. Obtain the optimal solution	5
				vi)	Define Longest Common Subsequence Problem. Give Dynamic Programming Solution for the given instance of problem.	10
					X= Notebook	10
					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.	
				ii)	2. Sort the following list of elements in ascending order using Merge sort technique.	
				iii)	27 10 12 20 25 13 55 22	
					3. Also compute complexity of the algorithm using Master theorem and Recursion tree method.	

Que. No. (Q3 b)	Question
i)	The algorithms like merge sort, quick sort and binary search are based on _____ Greedy Technique Divide and Conquer algorithm Dynamic Technique Backtracking Technique
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
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
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
v)	For any given sequence, there will ALWAYS be a unique increasing subsequence with the longest length. a) True b) False

Maximum Marks: 100 Programme code: I Programme: B. Tech. C Name of the Constituent College: K. J. Somaiya College of Engineering Course Code: 1161001C Instructions: 1) Explain with neat and clear diagram 2) All questions are compulsory 3) Assume suitable data	One No. Q1 Q2 A Q2 A	1. Number of nodes 2. Number of edges 3. Number of vertices 4. Number of levels 5. Number of paths 6. Effort = 7. Technical 8. User doc. 9. Cost = \$8 Various processes
--	----------------------------------	---

09.06.2023 (E)

Maximum Marks: 100	Semester: January 2023 – May 2023	
Programme code: 04	Examination: ESE Examination – KT	
Programme: BTech IT	Class: SY	
Name of the Constituent College: K. J. Somaiya College of Engineering	Semester: III (SVU 2020)	
Course Code: 116U04C303	Name of the department: IT	
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)	List any 5 advantages of database over file system.	5
ii)	Draw diagram for database system architecture.	5
iii)	Explain the Hierarchical database model in brief.	5
iv)	Define data independence? What is logical data independence?	5
v)	List down all DDL and DML commands.	5
vi)	What can naive users and application programmers do?	5

Que. No.	Question	Max. Marks
Q2 A	Solve the following	10
i)	Explain the concept of generalization with diagram.	5
ii)	What are views in database? Give syntax for create View. OR	5
Q2 A	Explain the domain and referential integrity constraints in database systems.	10
Q2 B	Solve any One	10
i)	Canberra Employment Centre (CEC) places temporary workers in companies during peak periods. CEC maintains a file of candidates who wish to work. If the candidate has worked before, that candidate has a specific job history. (Naturally, no job history exists if the candidate has never worked.) Each candidate may have several qualifications. CEC also has a list of companies that request temporaries. Each time a company requests a temporary employee, CEC makes an entry in the openings folder. This folder contains an opening number, company name, required qualifications, starting date, anticipated ending date, and hourly pay. Each opening requires only one specific qualification Draw an ER diagram that captures the above information, which should include: 1. Identifying the entities, relationships and their attributes 2. indicating the key attributes which you have chosen.	10
ii)	Explain the steps of EER to Relational model conversion with example.	10

Que. No.	Question
Q3	Solve any Two
i)	Explain 1NF, 2NF and 3NF with example.
ii)	What is indexing? Why it is use in database? Explain with example how indexing cost affects the overall budget of the project.
iii)	Explain the steps of query processing and optimization with diagram.

Que. No.	Question
Q4	Solve any Two
i)	Draw the transaction state-diagram and explain each of its state.
ii)	What are ACID properties? Explain with example.
iii)	Explain the concept of deadlock and deadlock prevention techniques.

Que. No.	Question	Que. No.	Q1 M1 Max
Q5	Write notes on any four		20
i)	Conflict serializability		5
ii)	View serializability		5
iii)	Deadlock avoidance techniques.		5
iv)	Two phase locking protocol.		5
v)	Shadow paging.		5
vi)	Validation based protocol.		5



Maximum Marks: 100	Semester: Jan 2023 - May 2023
Programme code: 01/01	Examination: ESE Examination
Programme: B. Tech Computer/IT Engineering	Class: SY Semester: IV (SVU 2020)
Name of the Constituent College: K. J. Somaiya College of Engineering	Name of the department: Computer/IT
Course Code: 116U01C401/116U02C401	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 <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	5
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 $(M/M/1/\infty)$ 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																						

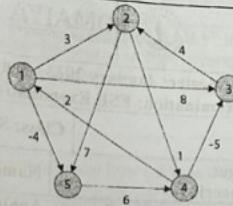
Q2 A	<p style="text-align: center;">OR</p> <p>Using Lagrange's Multiplier method solve the following NLPP $z = 2x_1^2 + x_2^2 + 3x_3^2 + 10x_1 + 8x_2 + 6x_3 - 100$ subject to $x_1 + x_2 + x_3 = 20$, $x_1, x_2, x_3 \geq 0$</p>	Q4	Solve any Two of the following														
Q 2 B	Solve any One of the following.	i)	The probability that an electric continuous use is 0.25 Use among 200 such components continuous use.														
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? (b) What fraction of potential customers are turned away? (c) What is the expected number of customers waiting for a haircut? (d) How much time can a customer expect to spend in the barber shop?</p>	ii)	A certain drug is claimed persons with cold. Half of sugar pills. The patients table using χ^2 -test (use 5														
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>		Helped														
	<table border="1"> <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> <td>No. of pages</td><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		Drug 150 Sugar pills 130 Total 280
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.	On the basis of this data significantly in curing	Solve the given LPP.														
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>	iii)	Maximise $z = 4x_1 + 5x_2$ Subject to $2x_1 + 5x_2 \leq 430$ $4x_1 + 3x_2 \leq 470$ $2x_1 + 3x_2 + 2x_3 \leq 400$ where $x_1, x_2, x_3 \geq 0$														
	<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>		Q5 Solve any Four														
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>		i) X follows a Uni														
			Find mean and														
			ii) If the tangent														
			$\sigma_y = 2\sigma_x$, find														
			A random sample regarded as significant														
			iv) Find the re														
			$z = 20 +$														
			v) Find the t														
			per hour minutes														
			vi) Obtain t														
			Minimiz														
			Subject to $-x_2 + 2x_3 + 3x_4 = 5$ $2x_1 + 3x_2 + 2x_3 - 2x_4 = 4$ where $x_1, x_2, x_3, x_4 \geq 0$														

Q4	Solve any Two of the following.																					
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.	20 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" style="margin-left: auto; margin-right: auto;"> <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)	Solve the given LPP by Simplex method Maximise $z = 4x_1 + 3x_2 + 6x_3$ Subject to $2x_1 + 5x_2 \leq 430$ $4x_1 + 3x_3 \leq 470$ $2x_1 + 3x_2 + 2x_3 \leq 440$ where $x_1, x_2, x_3 \geq 0$	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 $z = 20 + x_1 + 2x_2 + x_2x_3 - x_1^2 - x_2^2 - x_3^2$	5																				
v)	Find the traffic intensity of the system (M/M/1/ ∞) model if $\mu = 1 \text{ per hour}$, $\lambda = 8 \text{ per hour}$. Also find the probability that a customer has to wait for more than 20 minutes to be out of the service station.	5																				
vi)	Obtain the dual of the following LPP Minimise $z = 3x_1 + 17x_2 + 9x_3$ Subject to $-x_2 + x_3 \geq 3$ $-3x_1 + 2x_3 \leq 1$ $2x_1 + x_2 - 5x_3 = 1$ where $x_1, x_2, x_3 \geq 0$	5																				

Maximum Marks: 100	Semester: January 2023 - May 2023	Duration: 3 Hrs.
Programme code: 01+	Examination: ESE Examination	
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: 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																
Q 2 B	Solve any One	10																
i)	Consider the following table of Optimal Binary Search Technique (OBST) <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																



Maximum Marks
 Programme code
 Programme: B
 Name of the Co
 K. J. Somaya C
 Course Code: 1
 Instructions: 1
 3) Assume suit

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:-	10																					
	<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>	Jobs	J1	J2	J3	J4	J5	J6	Deadlines	5	3	3	2	4	2	Profits	200	180	190	300	120	130	
Jobs	J1	J2	J3	J4	J5	J6																	
Deadlines	5	3	3	2	4	2																	
Profits	200	180	190	300	120	130																	
	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.																						
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



Maximum Marks: 100

Programme code: 03

Programme: Electronics and
Telecommunication Engineering

Name of the Constituent College:

K. J. Somaiya College of Engineering

Course Code: 116U03C403

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

3) Assume suitable data wherever necessary

Semester: January 2023 – May 2023

Examination: ESE Examination

Duration: 3 Hrs.

Class: SY B.
Tech

Semester: IV(SVU 2020)

Name of the department: EXTC

Que. No.	Question	Max. Marks
Q1	Solve any Four	20
i)	Explain need of modulation in the aspect of antenna with suitable example.	5
ii)	Draw circuit diagram of Delayed AGC and explain briefly.	5
iii)	A $600\ \Omega$ resistor is connected across $600\ \Omega$ antenna input of a radio receiver. The bandwidth of the radio receiver is 20 kHz and the resistor is at room temperature of 27°C . Calculate the noise power and the noise voltage applied at the input of the receiver.	5
iv)	Compare between FM and PM.	5
v)	An FM wave is represented by following equation: $V_{FM}(t) = 10 \cos(8 \times 10^8 t + 7 \sin 6 \times 10^4 t)$ Volts Calculate a. Modulation index b. Frequency deviation c. Bandwidth using Carson's rule	5
vi)	Draw schematic diagram for PWM generation, input and output waveforms	5

Que. No.	Question	Max. Marks
Q2 A	Solve the following	10
i)	Given FM and PM modulators with the following parameters: FM deviation sensitivity $K_1 = 1.5\ \text{kHz/v}$ PM deviation sensitivity $K = 0.75\ \text{rad/v}$ In both modulators carrier frequency is $f_c = 500\text{kHz}$ and modulating signal is Case a) $v_m = 2 \sin(2\pi 2kt)$ Case b) If modulating signal frequency is changed to 1 kHz Calculate modulation indexes for both modulators with Case a and Case b	5

ii) For above question 2A i) considering case a) it is given that if Bessel function coefficients are $J_0 = 0.51$, $J_1 = 0.56$, $J_2 = 0.23$, $J_3 = 0.06$, $J_4 = 0.01$, identify number of significant sidebands and draw output spectrum.

OR

- Q2 A A sinusoidal carrier has amplitude of 10V and frequency 30 kHz. It is amplitude modulated by a sinusoidal voltage of amplitude 3V and frequency 1 kHz. Modulated output is taken across load resistor of $50\ \Omega$.
- Calculate modulation index.
 - Write the equation for modulated wave.
 - Plot the modulated wave showing maximum and minimum voltage values of the waveform.
 - Draw frequency spectrum of the AM waveform and calculate bandwidth.

Q2 B Solve any One

- Explain Phase Shift method for SSB generation.
- Explain balanced slope detector for Frequency Demodulation.

Que. No.	Question	Max Marks
Q3	Solve any Two	10
i)	In an AM receiver the loaded Q of the antenna coupling circuit is 125. Intermediate Frequency (I.F.) is 455kHz. Find image frequency and its rejection at 1MHz and 30MHz. Comment for which value of incoming signal frequency image rejection is better.	10
ii)	Explain local oscillator tracking error in radio receivers. Explain the methods to overcome tracking error.	10
iii)	Compare between PAM, PWM and PPM	10

Que. No.	Question	Max Marks
Q4	Solve any Two	20
i)	Explain Delta modulation transmitter with one suitable example.	10
ii)	How drawbacks of in Delta Modulation are overcome in adaptive delta modulation?	10
iii)	Explain the need of multiplexing in communication system. Explain any one type with suitable example.	10

Que. No.	Question	Max Marks
Q5	(Write notes / Short question type) on any four	20
i)	Different methods to characterize noise in electronic communication systems.	5

- A short note on VSB.
- Write a note on Noise.
- Explain tuning operation.
- Draw Block diagram.
- Explain Granular noise.

	A short note on VSB.	5
i)	Write a note on Noise Triangle.	5
iv)	Explain tuning operation for super heterodyne radio receiver.	5
v)	Draw Block diagram and input-output waveforms of PPM.	5
vi)	Explain Granular type of Noise in DM.	5

29.05.2023 (i)

100	Semester: January 2023 – May 2023 Examination: ESE Examination	Duration: 3 Hrs.
02		
Electronics Engineering B.Tech.	Class: SY	Semester: IV(SVU 2020)
constituent College: College of Engineering	Name of the department: ETRX	
116U02C404	Name of the Course: Analog and Digital Communication	
1) Draw neat diagrams 2) All questions are compulsory suitable data wherever necessary		

Question		Max. Marks
Solve any Four		20
State and explain the drawback of practical diode detector.		5
A transmitter transmits 10 kW of power without modulation and 14 kW after amplitude modulation. What is modulation index?		5
Compare between narrow band FM and wideband FM.		5
v) Explain working of AGC with suitable diagram.		5
v) Write short note on noise in PCM.		5
vi) Discuss pulse width modulation system.		5

Que. No.	Question	Max. Marks
Q2 A	Solve the following	10
i)	Calculate the percentage of power saving when the carrier and upper side band are suppressed in an AM wave modulated to a depth of 50 percent.	5
ii)	Explain the importance of modulation in communication system.	5
OR		
Q2 A	Explain phase shift method of SSB-SC generation with suitable diagram and mathematical expression.	10
Q 2 B	Solve any One	10
i)	List the different types of FM generation methods. Explain the principle of reactance modulator for FM generation with the help of neat circuit diagram.	10
ii)	Define Angle modulation. The equation of an angle modulated voltage is $V_c = 10 \sin(10^8 t + 3 \sin 10^4 t)$ What form of angle modulation is this? Calculate the following a) carrier and modulating frequencies, b) the modulation index and deviation, c) The power dissipated in a 100Ω resistor.	10

Que. No.	Question	Max. Marks
Q3	Solve any Two	20
i)	Define modulation index and deviation ratio in FM. Derive an expression for frequency modulated signal.	10
ii)	State Sampling theorem. Explain flat top sampling with diagram and waveforms. State its advantages and disadvantages.	10
iii)	Explain delta modulation with a neat block diagram and waveforms. Also explain slope overload error and granular noise.	10

Que. No.	Question	Marks
Q4	Solve any Two	20
i)	Explain why MSK is called shaped QPSK? Justify with relevant expressions and waveforms.	10
ii)	Explain in detail inter symbol interference (ISI) and state Nyquist condition for zero ISI.	10
iii)	Describe BFSK transmitter and receiver with the help of neat block diagram and waveform.	10

Que. No.	Question	Max. Marks
Q5	Write notes on any four	20
i)	Noise triangle in FM	5
ii)	Image frequency and its rejection	5
iii)	Vestigial sideband transmission (VSB)	5
iv)	PCM transmitter	5
v)	DPSK modulation	5
vi)	Matched filter receiver	5