Reg. No.: 22BET10020

Name : Harsh

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TERM END EXAMINATIONS (TEE) – August 2024

Programme	:	**B.Tech.**	**Semester**	:	**Fall Semester 2024-2025**
Course Name	:	**Probability, Statistics And Reliability**	**Course Code**	:	**MAT3003**
Date/Session	:	**28 Aug 2024/Session-I**	**Slot**	:	**B21+B22+B23+E21+E22**
Time	:	**3 Hrs.**	**Max. Marks**	:	**100**

Answer ALL the Questions

Q. No.		Question Description	Marks
		PART A – (60 Marks)	
1	(a)	State Axiomatic Definition of Probability. Why does it pay to bet consistently on seeing 6 at least once in 4 throws of a die, but on seeing a double six at least once in 24 throws with two dice?	12
		OR	
	(b)	State Bayes' Theorem. Using Bayes' theorem, solve the following question:	12
		In answering a question on a multiple choice test a student either knows the answer or he guesses. Let p be the probability that he knows the answer and 1- p the probability that he guesses. Assume that a student who guesses an answer will be correct with probability $\frac{1}{5}$, where 5 is the number of multiple-choice alternatives. What is the conditional probability that a student knew the answer to a question given that he answered it correctly?	
2	(a)	The probability of a man hitting a target is $\frac{1}{4}$.	12
		(i) If he fires 7 times, what is the probability of his hitting target at least twice.	
		(ii) How many times must he fire so that the probability of his hitting the target at least once is greater that $\frac{2}{3}$.	
		OR	
	(b)	Suppose that the life in hours of a certain part of radio tube is a continuous random variable X with p.d.f. given by:	12

$$f(x) = \begin{cases} \frac{100}{x^2}, when\ x \geq 100 \\ 0, elsewhere \end{cases}$$

(i) What is the probability that all of three such tubes in a given radio set will have to be replaced during the first 150 hours of operation?

(ii) What is the probability that none of three of the original tubes will have to be replaced during that first 150 hours of operation?

(iii) What is the probability that a tube will last less than 200 hours if it is known that the tube is still functioning after 150 hours of service?

3 (a) For the joint probability distribution of two random variables X and Y given below: 12

X \ Y	1	2	3	4
1	$\frac{4}{36}$	$\frac{3}{36}$	$\frac{2}{36}$	$\frac{1}{36}$
2	$\frac{1}{36}$	$\frac{3}{36}$	$\frac{3}{36}$	$\frac{2}{36}$
3	$\frac{5}{36}$	$\frac{1}{36}$	$\frac{1}{36}$	$\frac{1}{36}$
4	$\frac{1}{36}$	$\frac{2}{36}$	$\frac{1}{36}$	$\frac{5}{36}$

Find (i) the marginal distributions of X and Y, and
(ii) conditional distribution of X given the value of Y=1.

OR

(b) The joint p.d.f. of two random variables X and Y is given by: 12

$$f(x,y) = \frac{9(1+x+y)}{2(1+x)^4(1+y)^4}, 0 \le x < \infty, 0 \le y < \infty.$$

Find the marginal distributions of X and Y, and the conditional distribution of Y for X = x.

4 (a) Memory capacity of 9 students was tested before and after a course of meditation for a month. State whether the course was effective or not at 5% level of significance from the data below: 12

Before: 10 15 9 3 7 12 16 17 4
After: 12 17 8 5 6 11 18 20 3

Given: The critical value of the appropriate test statistic at d.f. = 8 is 2.31.

OR

(b) Two random samples drawn from two normal populations have the variable values as below: 12

Sample I: 19 17 16 28 22 23 19 24 16
Sample II: 28 32 40 37 30 35 40 28 41 45 30 36

Obtain estimate variance of population & test two populations have same variance at 5% level of significance.
Given: The critical value of the appropriate test statistic at d.f. = (8, 11) is 2.95.

5 (a) Three different acoustical systems are proposed for controlling noise intensity in an office. Measurements of noise intensity (decibels) that simulate heavy street traffic are made for all three acoustical systems at various locations in the office. Using a 5% level of significance and one-way ANOVA table, test whether or not the mean noise intensity for the three systems differs: 12

System 1	22	28	26	25	23
System 2	31	34	29	36	34
System 3	19	23	22	25	21

Given: The critical value of the appropriate test statistic at d.f. = (2, 12) is 3.89.

OR

(b) Given the data below, perform a two-way ANOVA. Use a level of significance of 1% to test (a) the hypothesis of interaction; (b) the null hypothesis of equal column means; (c) the null hypothesis of equal row means. 12

Factor	Level A		Level B		Level C	
Level 1	27	29	18	24	13	15
Level 2	17	21	21	21	12	16
Level 3	18	20	19	23	13	15

PART B – (40 Marks)

6 A bag contains 8 black and 2 red pens. If a pen is drawn at random, what is the probability that it is black pen or red pen? 8

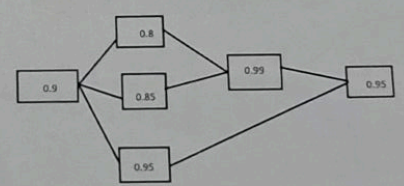
7 X is a normal variate with mean 30 and standard deviation 5. Find the probabilities (i) $26 \le X \le 40$, (ii) $X \ge 45$. 8

8 A computer while calculating correlation coefficient between two variables X and Y from 25 pairs of observations obtained the following results: 8

$n = 25, \sum X = 125, \sum X^2 = 650, \sum Y = 100, \sum Y^2 = 460, \sum XY = 508.$
Find the Karl Pearson's coefficient of correlation between X and Y.

9 A sample analysis of examination results of 200 MBA's was made. It was found that 46 students had failed, 68 secured a third division, 62 secured a second division and the rest were placed in first division. Are these figures commensurate with the general examination result which is in the ratio 4:3:2:1 for various categories respectively? (Given: The critical value of the appropriate test statistic at d.f. = 3 is 7.815) 8

10 The following system in series consists of components with the indicated nonfailure probabilities: 8



Compute the reliability of the system assuming independent failure events for the components.

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MID TERM EXAMINATIONS – July 2024

Programme	:	**B.Tech.**	Semester	:	**Fall Semester 2024-2025**
Course Title	:	**Educational Data Mining and Learning Analytics**	Course Code	:	**CET3001**
Date/Session	:	**20 July 2024/ Session I**	Slot	:	**A21+A22+A23+D21+D22**
Time	:	**1 ½ hours**	Max. Marks	:	**50**

Answer all the Questions

Q.No.	Sub. Sec.	Question Description	Marks
1		Illustrate with an example related to the steps involved in Educational Data Mining.	10
2		Scalable data mining and analytics techniques for large educational datasets: Explain with an example.	10
3		Find IQR, Q1, Q2, Q3, and outliers for the given dataset using hand calculation. Dataset = (32, 14, 5, 67, 88, 9, 11, 13, 5, 61, 7, 5)	10
4		Calculate z-score value to each of the data point and find the outliers as well. Dataset = (13, -41, 8, -44, 200, 9, 7, 13, 5, 14, 7, 5)	10
5	a)	Write a Python code to do display the heat map for correlation of multiple variables.	4
	b)	Write a Python code to display scatter plot	3
	c)	Write a Python code to display box plot.	3

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MID TERM EXAMINATIONS – JULY 2024

Programme	: B.Tech.	Semester	: Fall Semester 2024-25
Course Title	: Probability, Statistics, and Reliability	Code	: MAT3003
Date/Session	: 19 July 2024/ Session I	Slot	: A14+B14+C14+E14+F14
Time	: 1 ½ hours	Max. Marks	: 50

Answer all the Questions

Q.No.	Sub. Sec.	Question Description	Marks
1	(a)	A problem in statistics is given to three students A, B, C whose chances of solving it are 1/2, 1/3, 1/4, respectively. What is the probability that the problem will be solved?	5
	(b)	An urn contains 6 red balls and 3 blue balls. One ball is selected at random and is replaced by a ball of the other colour. A second ball is then chosen. What is the conditional probability that the first ball selected is red, given that the second ball was red?	5
2		In the test an examiner either guesses or copies or knows the correct answer. The probability that he makes a guess is 1/3 and the probability that he copies the answer is 1/6. The probability that his answer is correct, given that he copied it is 1/3 and the probability that his answer is correct, given that he guessed it is 1/4. Find the probability that he knew that answer, given that he correctly answered it.	10
3		A random variable X has the probability density function, $$f(x) = \begin{cases} x, & 0 \le x < 1; \\ 2-x, & 1 \le x < 2; \\ 0, & x \ge 2 \end{cases}$$ Find (i) Mean and variance of X. (ii) $P\left(\frac{1}{2} < X < \frac{3}{4}\right)$ (iii) $P\left((X > \frac{1}{2})/(X < \frac{3}{4})\right)$.	10
4		If the probability of hitting a target 1/6 and if 12 shots are fired, what is the probability of the target being hit at least thrice, assuming that at least two hit has been already achieved?	10
5		For a joint probability distribution of (X, Y) given blow:	10

		Values of Y			
		1	2	3	4
Values of X	0	k	2k	2k	3k
	1	2k	3k	k	4k
	2	0	k	2k	k
	3	3k	2k	3k	2k

Find (i) marginal density functions (ii) $P(X < 2)$, $P(Y \ge 1)$ (iii) $P(X \le 2, Y \le 1)$ (iv) $P(X \le 1/Y \le 2)$ (v) $P(X + Y \le 3)$

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MID TERM EXAMINATIONS – July 2024					
Programme	:	B.Tech.	Semester	:	Fall 2024-25
Course Title	:	Probability, Statistics and Reliability	Course Code	:	MAT3003
Date/Session	:	19 July 2024/ Session II	Slot	:	B21+B22+B23+E21+E22
Time	:	1 ½ hours	Max. Marks	:	50

Answer all the Questions

Q.No.	Sub. Sec.	Question Description	Marks
1		Box A contains 6 red and 4 blue balls, box B contains 3 red and 7 blue balls. Two balls are drawn at random from box A and placed in box B. Now, a ball is drawn at random from the box B. Find the probability that it is a blue ball.	10
2		There are 4 candidates for the post of Incharge of constructing a flyover. The probabilities that they will be selected are 0.3, 0.25, 0.35 and 0.1. The probabilities that the above selected candidates can get the job done on time are 0.4, 0.7, 0.3 and 0.2, respectively. What is probability that the job is done on time?	10
3		From a lot of 12 items containing 3 defective items, a sample of 4 items are drawn at random without replacement. Let a random variable X denote the number of defective items in the sample. Find the probability distribution of X.	10
4		A random variable X has the following probability distribution	10

X	0	1	2	3	4
$P(X)$	c	$2c$	$2c$	c^2	$5c^2$

(i) Find the value of c;
(ii) Evaluate $P(X < 3)$ and $P(0 < X < 4)$;
(iii) Find mean and variance of X.

5 For the following bivariate probability distribution of X and Y

X \ Y	0	1	2	3
0	$\frac{1}{32}$	$\frac{2}{32}$	$\frac{3}{32}$	$\frac{2}{32}$
1	$\frac{2}{32}$	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{32}$
2	$\frac{3}{32}$	$\frac{2}{16}$	0	$\frac{1}{16}$

10

Find
(i) $P(X \leq 1, Y = 3)$;
(ii) $P(Y \leq 2)$.

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MID TERM EXAMINATIONS – July 2024

Programme	:	**B.Tech.**	Semester	:	**Fall Semester 2024-2025**
Course Title	:	**Internet and Web Programming**	Course Code	:	**CSE4001**
Date/Session	:	**19 July 2024/ Session I**	Slot	:	**A14+B14+C14+E14+F14**
Time	:	**1 ½ hours**	Max. Marks	:	**50**

Answer all the Questions

Q.No.	Sub. Sec.	Question Description	Marks
1		Describe the W3C, Website, WWW and its evolution. Classify the types of protocols in details.	**10**
2		Construct the Web System Architecture with neat diagram in details. Outline the need for URL scheme and its types. Compare Absolute and Relative URL.	**10**
3		Demonstrate how many ways to create CSS with suitable example and output. Implement the Text and background colour changes in CSS.	**10**
4		Differentiate HTML and CSS. Create a student course registration form using HTML forms tags like buttons, checkboxes, Labels and text input fields with output.	**10**
5		Identify the need for Document Object Model with neat sketch and example. Discuss with example for String Methods using JavaScript.	**10**

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$P(0,1)$

$P(0,0) = \frac{3}{28}$

$P(Y \le 1) = 3k$

$= \frac{3}{32}$

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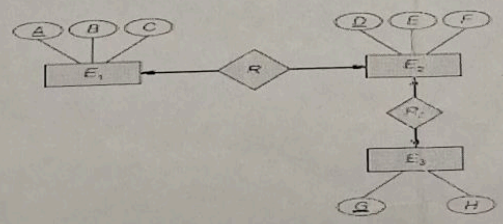
MID TERM EXAMINATIONS – July 2024

Programme	:	**B.Tech.**	Semester	:	**Fall Semester 2024-2025**
Course Title	:	**Database Management Systems**	Course Code	:	**CSE3001**
Date/Session	:	**15 July 2024/ Session I**	Slot	:	**B11+E11+B12+E12+B13**
Time	:	**1 ½ hours**	Max. Marks	:	**50**

Answer all the Questions

Q.No.	Sub. Sec.	Question Description	Marks
1		Write the purpose and limitation of "Mapping" in three schema architecture of database management system and elaborate the three-schema architecture with diagram.	**10**
2	(a)	Construct an Entity-Relationship diagram for the given scenarios (entities and associated attributes are provided) by incorporating following considerations: 1. Specify key attributes, and multivalued or composite attributes. 2. Self-referencing type (for employees) 3. Relationship type 4. Mention cardinality ratio 5. Is there any weak entity type? Justify your answer. **Scenarios:** The Company is organized into departments (**Department**), and each department has a unique name (DName), address (Daddress), Department number (DNumber) and phone (CPhone), and a particular employee id, who is incharge(Erole), id of employee (EID), product id of product manufactured (PID) and the start date (CStartDate) when that employee began working in the department. The department produces products (**Products**), and each product has unique name (PName), product id (PID), product price (Pprice), manufacture date (Mdate), expiry date (Edate), id of employee (EID). The employees (**Employees**) working in each department within which products has employees name (Ename), id of employee (EID), salary(Salary), address(Eaddress), role (Erole), and age(Eage).	**10**
3	(a)	**Find Minimum number of tables for following ER diagram?**	**5**



(b) Describes the Term with suitable examples:

a. Primary Kay
b. Referential Integrity 5
c. Super Key
d. Candidate Key
e. Weak Entity

4 State the reason for why the following schema not in 2NF. Normalize to 2NF

Sales (SalesID, ProductID, ProductName, SaleDate, CustomerID, CustomerName, Amount)

Functional Dependencies:

ProductID → ProductName 10

CustomerID → CustomerName

SalesID → SaleDate, Amount

(SalesID, ProductID) → Amount (assuming sales amount may depend on product and sale transaction)

5 Consider following Scheme and write SQL queries.

Course (C_id, C_name)

Project (P_id, P_name, P_technology)

Student (Roll, Sname, City, C_id, P_id)

i) Display all the record of students who admitted in CSE course? 10
ii) Display the list of Projects on Java Technology?
iii) Find the list of students whose name starts from 'a' character?
iv) Find the list of students who live in Bhopal only?
v) Find the list of students who work on JAVA technology projects

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TERM END EXAMINATIONS (TEE) – August 2024

Programme	:	B.Tech.[BET]	Semester	:	Fall Semester 2024-2025
Course Name	:	Educational Data Mining and Learning Analytics	Course Code	:	CET3001
Date/Session	:	22 Aug 2024/ Session II	Slot	:	A21+A22+A23+D21+D22
Time	:	3 Hrs.	Max. Marks	:	100

Answer ALL the Questions

Q. No.		Question Description	Marks
		PART A – (60 Marks)	
1	(a)	Examine the intricacies of Big Data technologies and the essential infrastructure that significantly impact educational environments.	12
		OR	
	(b)	Write in detail about various Ethical considerations in collecting, analyzing, and using educational data.	12
2	(a)	Calculate the Pearson Correlation for the given data variables (Math, Coding).	12

Math	1	8	9	7	6	5	4	3	8	7	6	4
Coding	3	7	8	2	9	5	4	2	6	4	5	6

OR

	(b)	Write a Python code to handle missing values using any of the five techniques.	12
3	(a)	Write a Python code to display the scatter plot and histogram.	12
		OR	
	(b)	Write a Python code to display the heat map for the correlation between any 5 variables.	12
4	(a)	Write a Python code for the linear regression analysis. Use the following parameters: ParentalEducation, StudyTimeWeekly, Absences, Tutoring, ParentalSupport, and GPA. While writing a code consider the following display attributes: Coefficient of each variable, B) intercept, C) Mean Squared Error, D) R2 Score, E) Residual Distribution plots.	12
		OR	

(b) Normalize the following data points [3, 6, 8, 2, 0, 1, 100, 45, 12] using Z-Score transformation and min-max scalar. 12

5 (a) Use a KMeans clustering method and find the centroids using the data variables x1 and x2: 12

Consider the initial level centroids are (4,2) and (3, 1).

x1	7	4	3	6	5	4	3	4
x2	2	2	1	7	3	9	6	8

OR

(b) Find Support, Confidence, Lift, Leverage, and Conviction for the given scenario for the Antecedent (Teaching Method) and consequent (Student Performance). 12

Class ID	Teaching Method, Subject, Student Performance
1	Group Work, Math, High
2	Lecture, History, Medium
3	Group Work, Science, High
4	Lecture, Math, Medium
5	Group Work, History, High

PART B – (40 Marks)

6 Calculate the Mean, Median, Mode, Variance, and Standard Deviation for any of the given data. Marks = [30, 40, 80, 2, 98, 10, 67] 8

7 Find outliers using the box plot method: Q1, Q2, Q3, IQR, Lower Bound, Upper Bound. 8

Data Points = [30, 40, 80, 2, 98, 10, 67, 5, 15, 32, 37, 48, 59, 74]

8 Write a Python code to display the box plot. 8

9 Consider the following values of the confusion matrix True Positive = 10, False Negative=10, True Negative=0, False Positive=75 and calculate the following: 8

- Precision
- Recall
- Accuracy
- F1 Score

10 Write a Python code for Association Rule mining using Apriori Algorithm You can assume any of the educational data. Find Support, Confidence Lift, Leverage, and Conviction for the given scenario. 8

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TERM END EXAMINATIONS (TEE) – August 2024

Programme	:	B.Tech	Semester	:	Fall Semester 2024-2025
Course Name	:	Internet and Web Programming	Course Code	:	CSE4001
Date/Session	:	21 Aug 2024/Session	Slot	:	A14+B14+C14+E14+F14
Time	:	3 Hrs.	Max. Marks	:	100

Answer ALL the Questions

Q. No.		Question Description	Marks
		PART A – (60 Marks)	
1	(a)	Construct the Web System Architecture with neat diagram in details.	12
		OR	
	(b)	Demonstrate with neat sketch for Client and Server-side Scripting and its difference.	12
2	(a)	Design an English alphabet chart for click on the alphabet the appropriate example must be display using HTML client-side image mapping with sample output.	12
		OR	
	(b)	Demonstrate with example for CSS and its types of selectors. Describe with example for Backgrounds and Borders in CSS with output.	12
3	(a)	Classify the JavaScript Array methods. Develop an online application to find the transpose of the given matrix. Obtain the number elements from the user based on the number of rows and columns using JavaScript.	12
		OR	
	(b)	Demonstrate the need for JQuery. Write a JavaScript program to display the employee details using JQuery.	12
4	(a)	Describe how Ajax works with neat sketch. Write the suitable example for Request and Response with sample output.	12
		OR	
	(b)	Describe the concept of XQuery, Schema and DTD. Implement student's marks card display using XQuery, Schema and DTD separately.	12
5	(a)	Differentiate Get and post method. Implement the event registration using PHP Form Handling operations with Get and post method with suitable output.	12
		OR	
	(b)	Demonstrate the need for MySQL. Implement the steps involved to connect MySQL database with PHP in details.	12
		PART B – (40 Marks)	
6		Classify the different types of protocols in details.	8
7		Write an example for CSS Text Transformation with sample output.	8
8		Demonstrate with example for Regular Expression. Implement ISBN number	8

	Validation of a given book using regular expressions.	
9	Outline the need for DTD. Write a code for students records like name, roll no, gender, age and mark using DTD.	8
10	Demonstrate the need for PHP and AJAX with suitable example.	8

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TERM END EXAMINATIONS (TEE) – August 2024

Programme	:	**B.Tech.**	**Semester**	:	**Fall Semester 2024-2025**
Course Name	:	**DATABASE MANAGEMENT SYSTEM**	**Course Code**	:	**CSE3001**
Date/Session	:	**27 Aug 2024/Session-I**	**Slot**	:	**B11+B12+B13+E11+E12**
Time	:	**3 Hrs.**	**Max. Marks**	:	**100**

Answer ALL the Questions

Q. No.		Question Description	Marks

PART A – (60 Marks)

1 (a) Discuss the level of Data Abstraction in the context of the three-layer architecture of a Database Management System. 12

OR

(b) Design ER Diagram: Assume we have the following application that models teams, the games they play, and the players in each team. In the design, we want to capture the following: We have a set of teams, each team has an ID (unique identifier), name, main stadium, and to which city this team belongs. 12

Each team has many players, and each player belongs to one team. Each player has a number (unique identifier), name, DoB, start year, and shirt number that he uses. Teams play matches, in each match there is a host team and a guest team. The match takes place in the stadium of the host team.

For each match we need to keep track of the following:

Each match has exactly three referees. For each referee we have an ID (unique identifier), name, DoB, years of experience. One referee is the main referee and the other two are assistant referee.

- The date on which the game is played
- The final result of the match.
- The players participated in the match. For each player, how many goals he scored, whether or not he took yellow card, and whether or not he took red card.
- During the match, one player may substitute another player. We want to capture this substitution and the time at which it took place.

Design an ER diagram to capture the above requirements. State any assumptions you have that affects your design.Make sure cardinalities and primary keys are clear.

2 (a) Consider the following schema and write **Relational Algebra** queries. 12

Suppliers (sid: integer, sname: string, address: string)
Parts (pid: integer, pname: string, color: string)
Catalog (sid: integer, pid: integer, cost: real)

The key fields are underlined and domain of each field is listed after the field name
1) Find the name of suppliers who supply some red parts.

1) Find the name of suppliers who supply some red parts.
2) Find the sids of suppliers who supply some red or green parts.
3) Find the sids of suppliers who supply some red part and some green part.
4) Find the sids of suppliers who supply every part
5) Find the sids of suppliers who supply every red or green part
6) Find the sids of suppliers who supply every red part

OR

(b) Explain the issues caused by redundancy and the concept and necessity of normalization. 12

3 (a) Write the **SQL queries** for the following relations keep track of airline flight information: Flights(flno: integer, from: string, to: string, distance: integer, departs: time, arrives: time, price: integer) 12
Aircraft(aid: integer, aname: string, cruisingrange: integer) Certified(eid: integer, aid: integer)
Employees(eid: integer, ename: string, salary: integer)

1. Find the names of aircraft such that all pilots certified to operate them earn more than 80,000.
2. For each pilot who is certified for more than three aircraft, find the eid and the maximum cruisingrange of the aircraft that he (or she) is certified for.
3. Find the names of pilots whose salary is less than the price of the cheapest route from Los Angeles to Honolulu.
4. For all aircraft with cruisingrange over 1,000 miles, find the name of the aircraft and the average salary of all pilots certified for this aircraft.
5. Find the names of pilots certified for some Boeing aircraft
6. Find the aids of all aircraft that can be used on routes from Los Angeles to Chicago.

OR

(b) Discuss the commands of Data Definition language, Data manipulation Language, Transaction Control Language and Data Control language using suitable examples? 12

4 (a) How optimization can improve the performance of a database server? Explain the various types of query optimization processes used in a DBMS. 12

OR

(b) How does RAID assist in data backup and recovery mechanisms? Explain the different levels of RAID utilized in the DBMS system. 12

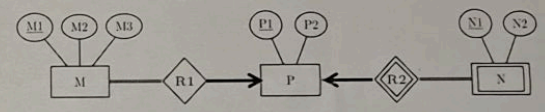
5 (a) Discuss the role of transactions in achieving concurrency control in the database server. Explain and compare conflict serializability and non-conflict serializable schedules with suitable examples. 12

OR

(b) Discuss the importance of Locking Protocols in a Database Management System and differentiate between PCL, 2PL, and S2PL protocols with suitable examples. 12

PART B – (40 Marks)

6 Consider the following ER diagram: 8



Find minimum number of tables needed to represent M, N, P, R1 and R2.

7 For the Relation X(PQRS) the functional dependencies are (QR→S, R→P, S→Q) and R has been decomposed into two schemas Y(PR) and Z(QRS). Answer the following question with proper explanation? 8

a) Find the number of possible candidate keys.
b) Determine the normal form of the state.
c) Identify if the given decomposition is lossy or lossless.
d) Determine if the given decomposition is dependency preserving or not.

8 Write a SQL Trigger that inserts the employee record into the Historical_Employee table when an employee is deleted from the Current_Employee table. 8

9 Create a stored procedure that generates a report on employees who earn a salary greater than 50k and belong to the age group between 30 and 45. The database scheme is as follows: 8
Employee (id, name, city, salary, age)

10 Consider the transactions T1, T2, and T3 and the schedules S1 and S2 given below.

T1: r1(X); r1(Z); w1(X); w1(Z)

T2: r2(Y); r2(Z); w2(Z)

T3: r3(Y); r3(X); w3(Y)

S1: r1(X); r3(Y); r3(X); r2(Y); r2(Z); 8
w3(Y); w2(Z); r1(Z); w1(X); w1(Z)

S2: r1(X); r3(Y); r2(Y); r3(X); r1(Z);
r2(Z); w3(Y); w1(X); w2(Z); w1(Z)

Test the Conflict Serializability of both S1 and S2 schedules?

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TERM END EXAMINATIONS (TEE) – August 2024

Programme	:	**B.Tech.**	**Semester**	:	**Fall Semester 2024-2025**
Course Title	:	**Database Management System**	**Course Code**	:	**CSE3001**
Date/Session	:	**22-Aug-2024/Session I**	**Slot**	:	**A21+A22+A23+D21+D22**
Time	:	**3 hours**	**Max. Marks**	:	**100**

Answer ALL the Questions

Q. No.		Question Description	Marks

PART A – (60 Marks)

1 (a) Consider the following description related to Research Sponsored Projects in an Educational Institution: 12

Institute has some sponsored Projects. Projects will have one Faculty as Principal Investigator(PI), and can have other faculty members as Co-PIs (up to 2). A Project has projectID(unique), project name, budget, duration, and start date. Faculty are identified by facultyID (unique) and have name, dept (has sub components depName, location), designation, contact number as other attributes. One faculty can have more than one contact number. A Projects is funded by only one Funding agency (like UGC, DIT etc.) which has- agency name (unique), chairman, Head Quarters, Ministry under which it works, as other attributes. Research Scholars work on projects (each scholar can work on only one project), some research scholars may not work on any project. Research scholar has rollNumber(unique), name, year of admission. Research scholars are supervised by one faculty only. A faculty can have zero to any number of scholars under his supervision.

Draw the **ER** diagram for the above description. Indicate- cardinality, keys, attributes, min-max, and participation constraints for entity-types involved in the relationships. Assume necessary data if found missing.

OR

(b) Explain the concept of data independence and how the Three-Schema Architecture facilitates it? In what scenarios might the Three-Schema Architecture be less effective or unnecessary? 12

2 (a) Consider the schema R(A,B,C,D,E,G) and set of functional dependencies given below: 12

AB →C,AC → B,AD → E, B → D,BC → A, E → G

Find out the candidate key(s) of the above relation. What is the normal form of above relation, justify. Normalize to BCNF.

OR

Normal
candi'k
BCNF

(b) What is the difference between an inner join and an outer join. Provide the result tables for following joins 12

i. Inner join on student and enrolled
ii. Left outer join on course and enrolled
iii. Right outer join on enrolled and student.

Student:

sid	name
1	john
2	alice
3	bob
4	raj

Course:

cid	cname
3001	dbms
3002	os
3003	algo

Enrolled:

sid	cid
1	3001
1	3003
3	3001
4	3003

3 (a) Explain the different types of triggers supported by SQL. Create a trigger that displays message 'new row inserted' every time insert operation is performed on a 'student' table. 12

OR

(b) **Students** (sid, sname, age) 12
Courses (cid, cname)
Enrolments (sid, cid, cgpa)
Professors (pid, pname, department)
Teaches (cid, pid, semester)
Based on the above schema, write SQL queries for following:

i. Find all professors who are teaching in the 'Spring2024' semester.
ii. List the courses along with the number of students enrolled in each course.
iii. Retrieve names of students who are enrolled in 'database' course.
iv. Retrieve the names of students who have cgpa above 8 in any course.

4 (a) Create a stored procedure to insert a new row into the Student table. where Student table has three attributes StudentID, FirstName, and LastName. Also, create a stored function to get the first name of a student given their StudentID from the same Student table. 12

OR

(b) Explain different phases of query processing. What are the various cost components of query execution. How does heuristic optimization handle select and project operations? 12

5 (a) In a certain log-based recovery system, which has checkpointing facility, following entries are seen in a partial log. 12
[T1, start]; [T2, start]; [T2, A, 10, 5]; [T2, B, 30, 50]; [T1, C, 20, 40]; [T3, start]; [T1, commit]; [T3, D, 14, 18] ; [Checkpoint]; [T3, C, 40, 98] ; [T4, start]; [T4, P, 40, 25]; [T4, K, 40, 75]; [T4, commit]; [T2, P, 25, 5]; [T3, D, 18, 68]; [T5, start]; //***System Crash***//.

Specify recovery operations(redo/undo)

(i) if deferred modification approach is used and
(ii) if immediate modification approach is used.

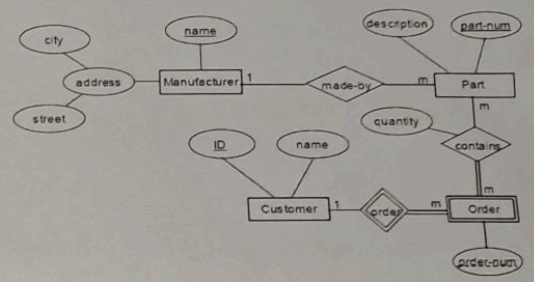
OR

(b) In a certain concurrent schedule, there are four transactions T1, T2, T3 and T4. These transactions operate on data items P, Q, and R. The interleaving of operations of these transactions is as given below. 12

Schedule :
[$r_2(P)$; $r_4(P)$; $w_2(P)$; $r_1(Q)$; $r_2(Q)$; $w_1(Q)$; $r_2(Q)$; $w_2(Q)$; $r_3(Q)$; $w_4(Q)$; $r_1(R)$; $r_3(P)$; $w_4(Q)$; $r_4(R)$]
Here, r_1 (P) - means that the transaction- T1 reads data item P, $w_2(Q)$ - means that the transaction- T2 writes data item Q. Find if the above schedule is conflict serializable, by means of a precedence graph. Give reasoning for your answer.

PART B – (40 Marks)

6 Convert the following ER into Relational schemas: Min no. 8



7 The relation ***R=(A,B,C,D,E,F)*** is decomposed into ***R1(A,B,C,D)***, ***R2(C,D,E)***, and ***R3(A,E,F)***. Find whether the decomposition is a lossless decomposition, if the following set F of functional dependencies holds. 8

F = {AB →CDEF; B →C; D →E; E →F}

8 What is a view in SQL, and how is it different from a table? How can views enhance the security of a database? 8

9 Consider a hash table of size 10 that uses internal hashing with hash function Kmod10. Insert given keys into the hash table in same order, linear probing should be used for collision resolution. 8
Keys: 15, 25, 35, 20, 30, 50, 10, 40, 55, 75

10 Consider the following ***partial schedule*** with four transactions - T1, T2, T3, and T4, running concurrently. Here A, B, and C are the data items. 8
Schedule :{T2_SL(B); T3_XL(B); T2_R(B); T4_XL(A); T1_SL(A); T4_W(A); T4_SL(B); T3_W(B); T1_XL(C); T3_SL(C); T1_R(C); T3_W(C)}
Here, T1_SL(A)-means that the transaction-1 locks data item A in shared mode; T1_XL(A) - means that the transaction-1 locks data item A in exclusive mode; T1_R(A) - means T1 reads data item A; T1_W(A) -means T1 writes data item A.
For the above schedule draw the **wait-for graph** and find if it is in deadlock state.

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AB-430

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TERM END EXAMINATIONS – May 2024

Programme	:	**B.Tech**	**Semester**	:	**Winter Semester 2023-24**
Course Title/ Course Code	:	**Probability, Statistics & Reliability /MAT3003**	**Slot**	:	**B11+B12+B13**
Time	:	**3 Hrs.**	**Max. Marks**	:	**100**

Answer ALL the Questions

PART A – (60 Marks)

Q. No.		Question Description	Marks
1	(a)	A total of 500 married couples are polled about their salaries with the following results	12

	husband makes less than $25K	husband makes more than $25K
wife makes less than $25K	212	198
wife makes more than $25K	36	54

$S = \frac{\Sigma(x-\bar{x})^2}{n-1} = \frac{\Sigma(x-\bar{x})^2}{n-1}$

i. Find the probability that a husband earns less than $25K.

ii. Find the probability that a wife earns more than $25K, given that the husband earns as that much as well.

iii. Find the probability that a wife earns more than $25K, given that the husband makes less than $ 25K.

OR

	(b)	Suppose a factory has machines I, II, and III that produce iWIN phones. The factory's record shows that Machines I, II and III produce, respectively, 2%, 1%, and 3% defective iWINs. Out of the total production, machines I, II, and III produce, respectively, 35%, 25% and 40% of all iWINs. An iWIN is selected at random from the factory.	12

Nd I

i. What is probability that the iWIN selected is defective?

ii. Given that the iWIN is defective, what is the conditional probability that it was produced by machine III?

2	(a)	Find the probability of getting at least 5 times head-on tossing an unbiased coin for 6 times by using the binomial distribution.	6
	(b)	The water from a lake is tested and is found to contain on average three bacteria per litre of water. A sample of 250 ml is collected from the lake. Determine the probability that the 250 ml water sample will contain	6

i. exactly two bacteria.

ii. at least two bacteria.

OR

Mod 2 (c) The marks obtained in Statistics by 1000 students in normally distributed with mean 78% and standard deviation 11%. 12
i. Determine how many students got marks above 90%.
ii. What was the highest mark obtained by the lowest 10% of the students.

3 (a) Calculate the regression coefficient and obtain the lines of regression for the following data 12

X	1	2	3	4	5	6	7
Y	9	8	10	12	11	13	14

OR

(b) The following table represents the joint probability distribution of the discrete random variable (X,Y) 12

X \ Y	1	2	3	4	5	6
1	1/36	2/36	2/36	2/36	2/36	K
2	2/36	1/36	2/36	2/36	K	0
3	1/36	2/36	1/36	K	0	0
4	2/36	1/36	K	0	0	0
5	1/36	K	0	0	0	0
6	K	0	0	0	0	0

Find
i. Value of K.
ii. Marginal distributions of X.
iii. Conditional distribution of X given Y=3.
iv. $[(X+Y) < 8]$.

4 (a) An ambulance service claims that it takes on the average less than 10 minutes to reach its destination in emergency calls. A sample of 36 calls has a mean of 11 minutes and the variance of 16 minutes. Test the claim at 0.05 los? 6

Mod 4 (b) A sample of 26 bulbs gives a mean life of 990 hours with a S.D of 20 hours. The manufacturer claims that the mean life of bulbs is 1000 hours. Is the sample not upto the standard? 6

OR

(c) Samples of students were drawn from two universities and from their weights in kilograms, mean and standard deviations are calculated and shown below. Make a large sample test to test the significance of the difference between the means. 6

	Mean	S.D	Size of the samp
University A	55	10	400
University B	57	15	100

(d) Samples of two types of electric bulbs were tested for length of life and following data were obtained 6

Type 1	Type 2
Sample number, $n_1 = 8$	$n_2 = 7$
Sample mean, $\overline{x_1} = 1234$	$\overline{x_2} = 1036$
Sample S.D, $s_1 = 36$	$s_2 = 40$

Is the difference in the mean sufficient to warrant that type 1 is superior to type 2 regarding length of life?

5 (a) The following table gives the number of refrigerators sold by 4 salesmen of Kelvinator (India) Ltd., in three months: May, June, July. 12

Month	A	B	C	D
May	45	40	38	37
June	43	41	45	38
July	39	39	41	41

Use ANOVA to test the hypothesis that mean sales are the same for three months.

OR

(b) Three different methods of teaching English are used on three group of students. Random samples of size 4 are taken from each group and the marks obtained by the sample students in each group are given. Use ANOVA to find out whether teaching methods had any effects on the students' performance at 0.01 levels 12

Group A	16	17	13	18
Group B	15	16	13	17
Group C	15	14	13	14

PART B – (40 Marks)

Mod 1 6 Two numbers are selected randomly from the digits 1 to 9. 8
i. If the sum is even number, what is the probability that 3 is one of the numbers selected?
ii. If 5 is one of the digits selected, what is the probability that the sum is odd?

7 The probability density function of a variate X is 8

x	0	1	2	3	4	5	6
$f(x)$	k	$3k$	$5k$	$7k$	$9k$	$11k$	$13k$

i. Find k.

ii. Find $P(X<4)$, $p(X \geq 5)$, $p(3 < X \leq 6)$.

iii. What will be the minimum value of k so that $p(X \leq k) > 0.3$?

8 Find Karl pearson's coefficient of correlation from the following data 8

Wages	100	101	102	102	100	99
Cost of living	98	99	99	97	95	92

9 The time taken by workers in performing a job by method I and method II is given below 8

Mod 4

Method I	20	16	26	27	23	22	-
Method II	27	33	42	35	32	34	38

Do the data show that the variances of time distribution from population from which these samples are drawn do not differ significantly?

10 Describe the Reliabilities of series and parallel systems with example. 8

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7.5625
7.3984

$S_1 = \frac{\Sigma(x_1 - \bar{x})^2}{n_1 - 1}$

$S_2 = \frac{\Sigma(y - \bar{y})^2}{n_2 - 1}$

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TERM END EXAMINATIONS (TEE) – October - November 2023

Programme	:	**B.Tech.**	**Semester**	:	**Fall 2023-24**
Course Title/ Course Code	:	**PROBABILITY, STATISTICS AND RELIABILITY/ MAT3003**	**Slot**	:	**C11+C12+C13+C14**
Time	:	**3 Hrs.**	**Max. Marks**	:	**100**

Answer ALL the Questions

Q. No.		Question Description	Marks
		PART A – (60 Marks)	
1	(a)	Two players A and B are competing at a trivia quiz game involving a series of questions. On any individual question, the probabilities that A and B give the correct answer are α and β respectively, for all questions, with outcomes for different questions being independent. The game finishes when a player wins by answering a question correctly. Compute the probability that A wins if (a) A answers the first question, (b) B answers the first question.	12
		OR	
	(b)	In a bolt factory machines A, B and C manufacture respectively 25%, 35% and 40% of the total of their output 5%, 4%, and 2% are defective bolts. A bolt is drawn at random from the product and is found to be defective. 1. What are the probabilities that it was manufactured by machines A. 2. What are the probabilities that it was manufactured by machines B. 3. What are the probabilities that it was manufactured by machines C.	12
2	(a)	For the following pdf (i) What is the value of constant? (ii) What is the value of cdf? (iii) Compute P(1.2<x<2.5) $$f(x) = \begin{cases} k(1-x^2); 1 < x < 2 \\ 0; otherwise \end{cases}$$	12
		OR	
	(b)	In a certain factory turning razor blades, if 14%, blades produced by the factory are defective. The blades are in packets of 12. Use the suitable distribution to calculate the approximate number of packets containing no defective, one defective, at most and at least five defective blades. Also represent each case graphically.	12
3	(a)	Determine Correlation coefficient (r) for the following data and fit both regression line.	12

X	50	60	70	80	90
Y	65	51	40	26	8

OR

(b) A random variable X has the probability density function, 12

$$f(x) = \begin{cases} x, & 0 \le x < 1; \\ 2 - x, & 1 \le x < 2; \\ 0, & x \ge 2 \end{cases}$$

Find cumulative distribution of X, mean, variance. Also, calculate $P\left(\frac{1}{2} < X < \frac{3}{4}\right)$ and $P\left((X > \frac{1}{2})/(X < \frac{3}{4})\right)$.

4 (a) Write the conditions for different types of t-tests and solve the given example by applying the suitable t-test. A random sample of specimens of coal from two mines, A and B, was drawn, and their heat production was measured, yielding the following results: 12

Mine A	9350	9070	9340	9130	9260
Mine B	8900	9140	8920	8840	8950

Is there significant difference between the means of two samples at 0.05 L.O.S. (tabulated t value with 8 DOF=2.306)

OR

(b) The following table show the opinions of voters before and after presidential elections. 12

	Before	After	Total
For ruling party	79	91	170
For opposition	84	66	150
Undecided	37	43	80
Total	200	200	400

Is there a change in the opinions of voters, and can this change be shown using a Chi-Square test at a 0.05 level of significance?(given that tabulated chi value with 2 DOF=5.991)

5 (a) Is there a statistically significant difference in test scores among students from three different schools (School -I, School -II, and School -III) based on both their grade levels (Grade A, B, C, D).The number of students with there grade are shown below for the three different schools: 12

Grade	School -I	School -II	School -III
A	80	87	84
B	87	79	88
C	93	60	79
D	50	60	80

Apply two-way ANOVA to test significance difference between the performance of students of three schools.

OR

(b) Describe the reliability. What is the important element of reliability? Conflicts with real world. In 1950 in India the mean life expectancy was 60 years. If the life expectancies from a random samples of 11 person are 68.2, 66.6,64.2,60.4,54.4,71.9,67.5,63.4,59.7,66.4,67.0, does it confirm the expected view. 12

PART B – (40 Marks)

6 If A and B are two very weak students of statistics and their chance of solving a problem correctly are $\frac{1}{8}$ and $\frac{1}{12}$. If the probability of their making a common solution is $\frac{1}{1001}$ and they obtained same answer, find the chance that their answer is correct. 8

7 A large number of measurement is normally distributed with a mean 65.5 and SD of 6.2. Find the percentage of measurement that fall between 54.8 and 68.8. 8

8 Ten competitors in a musical contest were ranked by judges A,B,C in the following order 8

Rank by A	6	5	10	3	2	4	9	7	8
Rank by B	5	8	4	7	10	2	1	6	9
Rank by C	4	9	8	1	2	3	10	5	7

Using correlation technique, find which pair of judges have more or less the same taste in music.

9 Show how you would use Student's t-test and F-test to decide whether the following two sample have been drawn from the same normal papulation. Which of two tests would you apply first and why. 8

	Size	Mean	Summ of square of deviations From the means
Sample-I	10	3	2.9
Sample-II	12	4	3.2

Given that t_{20} **(0.05)= 2.09,** $F_{10,9}$ **(0.05)=2.90.**

10 Apply the technique of one way ANOVA to the following data for finding significance difference between the samples. 8

Sample-1	Sample-2	Sample-3	Sample-4
5	13	9	8
13	8	11	11
9	11	6	7
10	13	10	10

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MID TERM EXAMINATIONS – April 2024

Programme	:	**B.Tech.**	Semester	:	**Winter 2023-24**
Course Title/ Course Code	:	**Probability, Statistics and Reliability / MAT3003**	Slot	:	**B11+B12+B13**
Time	:	**1 ½ hours**	Max. Marks	:	**50**

Answer all the Questions

Q.No.	Question Description	Marks
1	In a list of 100 people, 54 play cricket, 69 play football, and 35 play both cricket and football. If one of these people is selected at random, find the probability that (i) the person plays either football or cricket. (ii) the person does not play any of these two games. (iii) the person plays football but not cricket.	10
2	Three boxes contain 6 red, 4 black; 4 red, 6 black; 5 red, 5 black balls respectively. One of the boxes is randomly selected and a ball is drawn from it. Find the probability that (i) the ball is drawn from the first box, if it is found to be red. (ii) the ball is drawn from the third box, if it is found to be black.	10
3	The total number of hours, measured in units of 100 hours, that a family runs a vacuum cleaner over a period of one year is a continuous random variable X that has the probability density function as $$f(x) = \begin{cases} kx, & 0 < x < 1, \\ 2k - x, & 1 \le x < 2, \\ 0, & \text{elsewhere.} \end{cases}$$ (i) Find the value of constant k. (ii) Find the probability that over a period of one year, a family runs their vacuum cleaner between 50 and 100 hours. (iii) Find the variance and standard deviation of X.	10
4	A scientific report publishes that mice will live an average of 40 months when their diets are sharply restricted and enriched with vitamins and proteins. Assume that the lifetimes of such mice are normally distributed with a standard deviation of 6.3 months. Find the probability that a given mouse will live (i) between 37 and 49 months. (ii) less than 28 months. (iii) exactly 30 months.	10
5	The random variables X and Y, representing the proportions of service time in two ticket counters, are described by the following joint probability density function $$f(x,y) = \begin{cases} 8xy, & 0 \le y \le x \le 1, \\ 0, & \text{elsewhere.} \end{cases}$$ (i) Find the marginal density functions $g(x)$ and $h(y)$. (ii) Find the conditional density function $f(y\|x)$. (iii) Find the covariance of X and Y.	10

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MID TERM EXAMINATIONS – April 2024

Programme	:	**B.Tech.**	Semester	:	**Winter 2023-24**
Course Title/ Course Code	:	**Probability, Statistics and Reliability/ MAT3003**	Slot	:	**C11+C12+C13**
Time	:	**1 ½ hours**	Max. Marks	:	**50**

Answer all the Questions

Q. No.	Sub. Sec.	Question Description	Marks
1		Two cards are drawn successively and without replacement from an ordinary deck of playing cards. Compute the probability of drawing (a) Two hearts. (b) A heart on the first draw and a club on the second draw. (c) A heart on the first draw and an ace on the second draw.	10
2		Bowl B_1 contains two white chips, bowl B_2 contains two red chips, bowl B_3 contains two white and two red chips, and bowl B_4 contains three white chips and one red chip. The probabilities of selecting bowl B_1, B_2, B_3, or B_4 are $1/2, 1/4, 1/8$, and $1/8$, respectively. A bowl is selected using these probabilities and a chip is then drawn at random. Find (a) $P(W)$, the probability of drawing a white chip. (b) $P(B_1 \mid W)$, the conditional probability that bowl B_1 had been selected, given that a white chip was drawn.	10
3		Ali Baba ventures into a cavern teeming with stolen treasures amassed by bandits. He faces a probability of bringing back 60 gold coins successfully, which stands at 1/3. The probability of bringing home 40 gold coins is at 1/2. Define the random variable X to represent the number of gold coins Ali Baba brings back. Express the probability function of X and depict it graphically. Additionally, calculate the expected number of gold coins Ali Baba is likely to return home with.	10
4		If Z is $N(0,1)$, find values of c such that (a) $P(Z \geq c) = 0.025$. (b) $P(\lvert Z \rvert \leq c) = 0.95$. (c) $P(Z > c) = 0.05$. (d) $P(\lvert Z \rvert \leq c) = 0.90$.	10
5		Determine which line, either Line A or Line B, better fits the given data points. (i) For Line $A: y = -1 + 3x$ and Line $B: y = 1 + 2x$ Data points:	

x	1	2	3
y	4	3	8

(ii) For Line $A: y = 3 - 0.6x$ and Line $B: y = 4 - x$ **10**
Data points:

x	0	2	2	5	6
y	4	2	0	-2	1

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MID TERM EXAMINATIONS – April 2024

Programme	:	**B.Tech.**	Semester	:	**Winter 2023-24**
Course Title/ Course Code	:	**PROBABILITY, STATISTICS AND RELIABILITY /MAT3003**	Slot	:	**B21+B22+B23**
Time	:	**1 ½ hours**	Max. Marks	:	**50**

Answer all the Questions

Q.No.	Question Description	Marks
1	Two numbers are selected randomly from the digits 1 to 9. (a) If the sum is even number, what is the probability that 3 is one of the numbers selected? (b) If 5 is one of the digits selected, what is the probability that the sum is odd?	10
2	A person uses his car 30 times, walks 30 times and rides the bus 40 times as he goes to work. He is late 10 times when he walks, late 3 times when he drives and late 7 times when he takes the bus. (a) What is the probability he took the bus if he was late? 30 (b) What is the probability he walks if he is on time?	10
3	A random variable X has the following probability function	

X=x	1	2	3	4	5	6
P(X)	K	3K	5K	7K	9K	11K

Determine 10

(a) K

(b) Expectation

(c) Mean

(d) Variance

(e) P(2<X<5).

4 The marks obtained in Probability and Statistics by 35 students is normally distributed with mean 64 and standard deviation 12. Determine

(a) How many students got marks above 95? 10

(b) Find the highest mark obtained by the students who fall within the lowest 40% of the overall performance distribution.

(c) What is the range within which the middle 75% of students scores fall ?

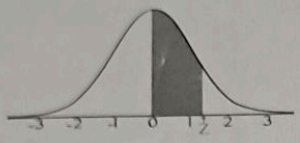
5 The following table represents the joint probability distribution of the discrete random variable (X,Y) 10

X \ Y	1	2	3	4	5	6
1	1/36	2/36	2/36	2/36	2/36	K
2	2/36	1/36	2/36	2/36	K	0
3	1/36	2/36	1/36	K	0	0
4	2/36	1/36	K	0	0	0
5	1/36	K	0	0	0	0
6	K	0	0	0	0	0

Find

(a) Value of K.
(b) Marginal distributions of X.
(c) Marginal distributions of Y.
(d) Conditional distribution of X given Y=3.
(e) P [(X+Y) < 8].

STANDARD NORMAL TABLE (Z)



Entries in the table give the area under the curve between the mean and z standard deviations above the mean. For example, for $z = 1.25$ the area under the curve between the mean (0) and z is 0.3944.

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0190	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2969	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3513	0.3554	0.3577	0.3529	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990
3.1	0.4990	0.4991	0.4991	0.4991	0.4992	0.4992	0.4992	0.4992	0.4993	0.4993
3:2	0.4993	0.4993	0.4994	0.4994	0.4994	0.4994	0.4994	0.4995	0.4995	0.4995
3.3	0.4995	0.4995	0.4995	0.4996	0.4996	0.4996	0.4996	0.4996	0.4996	0.4997
3.4	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4998

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MID TERM EXAMINATIONS – September 2023

Programme	:	B.Tech.	**Semester**	:	Fall 2023-24
Course Title/Course Code	:	Advanced Technical Communication / ENG 2005	**Slot**	:	A 11+A12
Time	:	1 ½ hours	**Max. Marks**	:	50

Answer all the Questions

Q.No.	Sub. Sec.	Question Description	Marks
1	(a)	**In the following questions choose the word which best expresses the meaning of the given word-**	

1. COMPETENT:
   a) Inept b) Malicious c) Callous d) Capable
2. BLATANT:
   a) Concealed b) Inconspicuous c) Subtle d) Outright
3. DEFER:
   a) Adjust b) Allow c) Advance d) Adjourn
4. HUMILIATING:
   a) Creditable b) Graceful c) Irrelevant d) Ignominious
5. COMPASSION:
   a) Animosity b) Judgement c) Admonition d) Empathy

5

3

(b) **In the following questions choose the word which is the exact OPPOSITE of the given words.**

1. EVACUATE:
   a) Agreement b) Vacate c) Hold d) Remove
2. QUIT:
   a) Renounce b) Abdicate c) Sustain d) Decamp
3. RECLUSE:
   a) Sedentary b) Dissocial c) Convivial d) Fixation
4. PERSUADE:
   a) Devastate b) Dread c) Dissuade d) Deter
5. DISRUPT:
   a) Rattle b) Spoil c) Reconciliation d) Muddle

5

4

2 (a) **Some proverbs/idioms are given below together with their meanings. Choose the correct meaning of proverb/idiom.**

1. FABIAN POLICY
   a) Democratic Policy
   b) Market policy
   c) Policy of gradual reforms
   d) Dictatorial policy

2. TO KICK THE BUCKET
   a) To start an account
   b) To start a sea journey
   c) To start agricultural activity
   d) To die

3. TO EAT HUMBLE PIE
   a) To eat slowly
   b) To have an excellent dis
   c) To live in a modest manner
   d) To have to apologise

4. ODDS AND ENDS
   a) Quarrelsome persons
   b) Various intentions
   c) Nonsense
   d) Miscellaneous things

5. TO PICK UP THE GAUNTLET
   a) To accept felicitation
   b) To accept bribe
   c) To accept senior post
   d) To accept a challenge

5

(b) **In questions given below out of four alternatives, choose the one which can be substituted for the given sentence.**

1. Saying thing in a circuitous way
   (a) Cervine (b) Carrion (c) Circumlocution (d) Clio
2. An office with high salary but no work:
   (a) Fanatic (b) Honorary (c) Sinecure (d) Explicit
3. A woman who never gets married
   (a) Cackle (b) Girl (c)Spinster (d) Unmarried
4. A person with strange and peculiar habits
   (a) Fathom (b) Explicit (c) Eccentric (d) Exodus
5. A Comparison that is out of place:
   (a) Inapt (b) Inaudible (c) Improbable (d) Insolvent

5

3 (a) **Select the appropriate option from the given options to make a meaningful sentence using the rules on subject verb agreement-**

1. The world _____ so rapidly that we can hardly keep up.
   a) change b) changes c) have changes d) is change
2. People _____ often ten or twenty years behind the times in their knowledge of the world.
   a) Is b) are c) have d) has
3. People who _____ in poverty often do not even have television or newspaper.
   a) lives b) live c) is living d) had living
4. A notebook and a pen _____ lying on the desk in the library.
   a) is b) are c) had d) have
5. Either the worker or the manager ____ coming to the conference.
   a) are b) is c) was d) were

5

(b) **In the following questions choose the correct options to fill in the blanks.**

1. 'I am old _____ I still play football.'
   a) and B) because C) but D) so
2. 'Max wants to learn carpentry _____ his maths isn't good enough yet.'
   a) and B) so C) but D) because
3. 'I got your message _____ I came over straight away.'
   a) but B) and C) so D) because
4. 'We had to cancel the church meeting _____ the hall was flooded.'
   a) and B) but C) because D) so
5. 'The chicken is in the oven _____ the potatoes are boiling on the hob.'
   a) but B) because C) and D) so

5

4 Is it more likely to have communication gaps with people from different cultural or ethnic backgrounds than with someone from your own background? How would you overcome these gaps? (200- 250 words) **10**

5 Describe some internal factors that act as barriers to proper listening. (200-250 words) **10**

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Term End Examinations, Fall Semester 2023-24

Programme	:	**B. Tech**	**Semester**	:	**FALL2023-34**
Course Title / Course Code	:	**Advanced Technical Communication / ENG 2005**	**Slot**	:	**A11+A12**
Time	:	**3 Hrs.**	**Max. Marks**	:	**100**

Answer ALL the Questions

Q. No.		Question Description	Marks
		PART A – (60 Marks)	
1	(a)	Do as directed-	12

1. Anomalous (Synonyms)
   (a) Unusual
   (b) Unbelievable
   (c) Unthinkable
   (d) Unsuitable

2. Malicious (Synonyms)
   (a) Spurious
   (b) Spiteful
   (c) Subjective
   (d) Superfluous

3. Exude (Synonyms)
   (a) Expose
   (b) Expel
   (c) Express
   (d) Extol

4. Consummate (Antonyms)
   (a) Imperfect
   (b) Sluggish
   (c) Melancholy
   (d) Dull

5. Reproof (Antonyms)
   (a) Brawl
   (b) Approval
   (c) Omission
   (d) Ambiguity

6. Felicitous (Antonyms)
   (a) Jealous
   (b) Demanding
   (c) Inapt
   (d) Inaccessible

OR

(b) Do as Directed: 12

1. A student who stays away from school without informing his/her parents. (One-word Substitution)
   (a) Truant
   (b) Spinster
   (c) Eccentric
   (d) Stub
2. A series of three novels/works of art produced by a writer. (One-word Substitution)
   (a) Theist
   (b) Trilogy
   (c) Stormy
   (d) Trigraph
3. One who totally abstain from drinking. (One-word Substitution)
   (a) Panacea
   (b) Epicurean
   (c) Teetotaller
   (d) Expiation
4. He hasn't got a criminal record-he's clean as a whistle. (give the meaning of the idioms/phrase)
   (a) Clean the air
   (b) A cold snap
   (c) Come what may
   (d) Be as clean as whistle
5. The police were round again last night, asking questions. (give the meaning of the idioms/phrase)
   (a) Break the ice
   (b) Carrot and stick
   (c) On the carpet
   (d) The boys in blue
6. A small fault in a person or system which might cause them to fail. (give the meaning of the idioms/phrase)
   (a) Bad blood
   (b) A bean counters
   (c) A cold snap
   (d) An Achilles' heel

2 (a) 1. Choose the sentence with the correct subject-verb agreement: 12
   a) The team is playing well.
   b) The team are playing well.
2. Which of the following sentences has a subject-verb agreement error?
   a) She and her friends is going to the concert.
   b) She and her friends are going to the concert.
3. Select the sentence with the correct subject-verb agreement:
   a) Neither the book nor the movie were interesting.
   b) Neither the book nor the movie was interesting.
4. Identify the sentence with the correct subject-verb agreement:
   a) Each of the students has their own book.
   b) Each of the students have their own book.
5. Choose the sentence that demonstrates proper subject-verb agreement:
   a) The flowers in the garden is blooming.
   b) The flowers in the garden are blooming.
6. Which of the following sentences has an error in subject-verb agreement?
   a) My brother and I enjoys playing tennis.
   b) My brother and I enjoy playing tennis.

OR

(b) Choose the correct option for each question. 12

1. I like coffee _____ tea.
   a) or
   b) but
   c) and
   d) so
2. She studied hard _____ she could pass the exam.
   a) and
   b) but
   c) or
   d) nor
3. He wanted to go to the party, _____ he had to work late.
   a) but
   b) so
   c) because
   d) or
4. I'm not sure if I should buy the red dress _____ the blue one.
   a) or
   b) and
   c) but

d) because

5. John neither likes pizza _____ hamburgers.
   a) nor
   b) and
   c) but
   d) because

6. I will study hard _____ I want to get a good grade on the test.
   a) because
   b) or
   c) as
   d) so

3 (a) "Is it more likely to have communication gaps with people from different cultural or ethnic backgrounds than with someone from your own background?" How would you overcome these gaps? 12

OR

(b) "Listen not only with your ears but also with your eyes." Justify your answer with suitable reasons. 12

4 (a) "Rapport equals trust plus comfort." Elaborate. 12

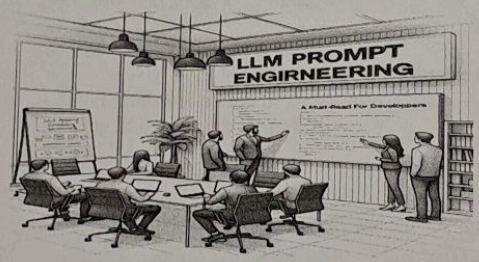
OR

(b) **Write an essay by developing the following hints.** 12
Action against legal permissions to spoil environment – movement – codification of ecocide as a fifth crime against peace – to transform our understanding of nature – sustainable use of Nature – formidable challenges – Awareness up – Paris Climate agreement – prevent crimes against Nature.

5 (a) "In many workplaces, online communication is becoming more commonplace than face-to-face meetings. To what extent do you agree or disagree with this statement?" Submit your opinion the regard in 150- 200 words. 12

OR

(b) Draw inferences collecting all requisite information from the picture- 12



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nd?" How would you

ify your answer with 12

12

12

nt – codification of
tanding of nature –
up – Paris Climate

commonplace than 12
th this statement?"

12

PART B – (40 Marks)

6 "Imagine you are a student representative in your university campus, and you've noticed an issue that needs addressing. Write a proposal to the school administration outlining the problem, suggesting a solution, and explaining why your proposal is important. Be sure to include supporting evidence and a clear plan for implementation. Your proposal should be well-organized, persuasive, and targeted towards the university's decision-makers." 15

7 The following table shows details about the internet activities for six categories for different age groups. Write an analytical paragraph for the table given in around 150-200 words. 15

Internet Activities by Age Group

	Age group						
Activity%	Teens	20s	30s	40s	50s	60s	70+
Get News	76	73	76	75	71	74	70
Online games	81	54	37	29	25	25	32
Downloads	52	46	27	15	13	8	6
Product research	0	79	80	83	79	74	70
Buying a product	43	68	69	68	67	65	41
Searching for people	5	31	23	23	24	29	27

8 You have been asked to address a seminar on the importance on Communication Skills for Industry People. Draft an appropriate speech for the occasion. 10

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MID TERM EXAMINATIONS – September 2023

Programme	:	**B.Tech.**	Semester	:	**Fall 2023-24**
Course Title/Course Code	:	**Introduction to Computational Physics/ PHY1003**	Slot	:	**E11+E12+E13+E14**
Time	:	**1 ½ hours**	Max. Marks	:	**50**

Answer all the Questions

Q.No.	Sub. Sec.	Question Description	Marks
1	(a)	Describe when it is most appropriate to use each type of plots below: i.Bar Graphs, ii.Pie Charts, iii. Histograms, iv. Contour Plots, and v. Scatter Plots	8 **10** 4
2	(a)	Explain the concept of linear regression and its use in data fitting. Provide a step-by-step explanation on how to fit a polynomial regression model $ax^2 + bx + c$ to a dataset, and calculate the error for a specific data point using the fitted polynomial model.	8 **10** 2
3	(a)	Find the curl of $\vec{F}(x,y) = \sin(xy)\hat{i} + \cos(xy)\hat{j}$. Then, calculate the divergence of the vector field obtained from curl of vector **F**.	6 **10** 0
4	(a)	Find the value of c and d, when $6A^{-1} = A^2 + cA + d\,I$. Matrix A is given as $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & -2 & 4 \end{bmatrix}$	6 **10** 3 5
5	(a)	Find the expected value of the outcome when a die is rolled.	3 **10** 0

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END TERM EXAMINATIONS – October- November 2023

Programme	:	**B.Tech.**	Semester	:	**Fall 2023-24**
Course Title/ Course Code	:	**Introduction to Computational Physics/ PHY1003**	Slot	:	**E11+E12+E13+E14**
Time	:	**3 hours**	Max. Marks	:	**100**

Answer ALL the Questions

Q. No.		Question Description	Marks
		PART A – (60 Marks)	
1	(a)	Fit a straight line to the data given below. Also estimate the value of y at x=2.5.	12

x	0	1	2	3	4
y	1	1.8	3.3	4.5	6.3

		OR	
	(b)	Create a flowchart that demonstrates the process of linear interpolation to estimate values between two known data points in a given dataset.	12
2	(a)	$\nabla\phi$ Find if (a) $\varphi = \ln \lvert \mathbf{r} \rvert$, (b) $\varphi = 1/\mathbf{r}$	12
		OR	
	(b)	Calculate the vector product of $\mathbf{i} + \mathbf{j}$ and $\mathbf{i} - \mathbf{j}$.	6
	(c)	Find the determinant of the vectors mentioned below: $a = 2\mathbf{i} + 3\mathbf{j} + \mathbf{k}$, $b = 3\mathbf{i} + 5\mathbf{j} - \mathbf{k}$, and $c = \mathbf{i} - \mathbf{j}$	6
3	(a)	Design a flowchart to compute the mean, median, mode, standard deviation, and range for a dataset entered by the user.	12
		OR	
	(b)	Find the domain and range of the following function: i. f(x)= 2x-1/x+4 ii. f(x)= 1/x	12
4	(a)	An object is launched at a velocity of 20 m/s in a direction making an angle of 25° upward with the horizontal. a) What is the maximum height reached by the object? b) What is the total flight time of the object? c) What is the horizontal range of the object? d) What is the magnitude of the velocity of the object just before it hits the ground?	12

		OR	
	(b)	How would you design a flowchart to allow the user to input the initial parameters of the projectile motion and handle variable time steps for the trajectory calculations.	12
5	(a)	Derive differenital equation for damping oscillations and writes its solution.	12
		OR	
	(b)	In a damped oscillator with m=500g, K=100N/m and b=75g/s, the ratio of the amplitude of the damped oscillations to the initial amplitude at the end of the 20 cycles is given as e^{-x}. Find x.	12
		PART B – (40 Marks)	
6		Data interpretation involves the systematic examination of data through predefined methodologies to extract significance and draw pertinent conclusions. Elaborate on how data interpretation differs for different types of data with examples for each data types.	8
7		Find all eigenvalues and corresponding eigenvectors for the following matrix $\begin{pmatrix} 2 & -3 & 0 \\ 2 & -5 & 0 \\ 0 & 0 & 3 \end{pmatrix}$	8
8		Define measures of central tendency and dispersion. Explain why the standard deviation of 2, 2, 2, 2, 2, 2, and 2 is zero.	8
9		What is elastic collision ? Derive an expression for final velocities of two bodies which undergo elastic in one dimension. A 5 kg ball moving east at a speed of 6 m/s strikes a 2 kg ball at rest. Calculate the velocities of the two balls assuming a perfectly elastic collision..	8
10		The displacement of a particle at t = 0.25 s is given by the expression x = (4.0 m) cos (3.0 πt + π) where x is in meters and t is in seconds. Determine (a) the frequency and period of the motion, (b) the amplitude of the motion, (c) the phase constant, and (d) the displacement of the particle at t = 0.25 s.	8

□□□

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MID TERM EXAMINATIONS – September 2023					
Programme	:	**B.Tech.**	Semester	:	**Fall 2023-24 / Trimester I & IV 2023-24**
Course Title / Course Code	:	**Digital Logic and Computer Architecture/ CSA2003**	Slot/Class No.	:	**D11+D12+D13+D14**
Time	:	**1 ½ hours**	Max. Marks	:	**50**

Answer all the Questions

24

Q.No.	Sub. Sec.	Question Description	Marks
1	(a)	Prove that AND-OR network is equivalent to NAND-NAND network. 5	5
	(b)	Simplify the expression: F(A,B) = (A'+B) (A+B) 3	5
2		Minimize the following Boolean function: F(A, B, C, D) = Σm(0, 2, 8, 10, 14) + Σd(5, 15) using K-maps. 8	10
3		Realize D flip-flop implementation from a J-K flip-flop. 8	10
4		Differentiate between Mealy Machine and Moore Machine: How they can be connected to realize a Finite State Machines?	10
5		Explain in detail the different types of instruction and classify various addressing modes.	10

6

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TERM END EXAMINATIONS (TEE) – October - November 2023

Programme	:	**B. Tech**	**Semester**	:	**Fall 2023-24/Trimester I/IV 2023-24**
Course Title/ Course Code	:	**Digital Logic and Computer Architecture /CSA2003**	**Slot**	:	**D11+D12+D13+D14**
Time	:	**3 Hrs.**	**Max. Marks**	:	**100**

Answer ALL the Questions

Q. No.		Question Description	Marks
		PART A – (60 Marks) 46	
1	(a)	How does DeMorgan's theorem apply to logical operations, and what are its implications in simplifying or transforming Boolean expressions?	12
		OR	
	(b)	Minimize the following Boolean function - F (A, B, C, D) = Σm(0, 1, 3, 5, 7, 8, 9, 11, 13, 15)	12 10
2	(a)	Distinguish between combinational logic and sequential logic and how can we effectively design a counter or shift register for a specific application or purpose, considering various design parameters and constraints?	12 10
		OR	
	(b)	Write the characteristics table and equation and logical diagram of JK flip flop.	12
3	(a)	Provide a brief overview of the instruction cycle and describe the function and significance of three-state buffers within it.	12
		OR	
	(b)	Analyse and illustrate with suitable example of Arithmetic Micro operations, logic micro-operations, shift micro-operations, Arithmetic logic shift unit.	12 8
4	(a)	Discuss about the various types of addressing modes by taking suitable example?	12
		OR	
	(b)	Explain with block diagram of basic organization of micro programmed control unit?	12 8
5	(a)	Define Pipelining and explain the stages of a typical instruction pipeline in a processor.	12
		OR	
	(b)	Illustrate the differences between a RISC (Reduced Instruction Set Computing) pipeline and a CISC (Complex Instruction Set Computing) pipeline.	12 10

PART B – (40 Marks) 30

6 Design a logic circuit that accepts a 4 bit gray code and converts it into 4 bit binary code. 8 8

7 Design a 4:1 multiplexer circuit and elucidate its operational principles, accompanied by a logic diagram that illustrates the functionality of the 4:1 multiplexer. 8 6

8 A processor has 32 distinct instructions with 12 instructions having 8 microinstructions and 20 having 20 microinstructions. 8

(a) How many addresses are used in control store memory?

(b) If eight instructions branch to another set of microinstructions, each having six microinstructions then how many addresses are now used in control store memory? Assume that each microinstruction also stores a branch address and thus neglect branching microinstruction. 8

9 What values are represented by the following IEEE single-precision floating-point numbers? 8

(a) 0b1011 1100 0100 0000 0000 0000 0000 0000 4

(b) 0b0101 0100 0110 0000 0000 0000 0000 0000

(c) 0b1100 0010 1111 0000 0000 0000 0000 0000

10 Given an unpipelined processor with a 10 ns cycle time and pipeline latches with 0.5 ns latency, what are the cycle times of pipelined versions of the processor with 4 and 8, stages if the Datapath logic is evenly divided among the pipeline stages? 8

Also, what is the latency of each of the pipelined versions of the processor? 4

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TERM END EXAMINATIONS (TEE) – October - November 2023

Programme	:	**B.Tech.**	**Semester**	:	**Fall 2023-24**
Course Title	:	**DATA STRUCTURES AND ANALYSIS OF ALGORITHMS / CSD3009**	**Slot**	:	**D21+D22+D23+D24**
Time	:	**3 Hrs.**	**Max. Marks**	:	**100**

Answer ALL the Questions

Q. No.		Question Description	Marks
		PART A – (60 Marks)	
1	(a)	Demonstrate the significance of algorithm analysis. Explain the Asymptotic Notations (Big O, Ω, θ) used while analyzing an algorithm.	12
		OR	
	(b)	Explain the tree traversal operations using linked list with suitable example. Write the algorithms for pre-order, in-order, and post-order traversal.	12
2	(a)	Explain applications of stack? Write the algorithm to implement stack using linked list to perform PUSH and POP operations.	8
	(b)	A single array A [1, 2, 3.....MAX] is used to implement two stacks. The two stacks grow from opposite ends of the array. Variables top1 and top2 (topl < top 2) point to the location of the topmost element in each of the stacks. If the space is to be used efficiently, then what will be the condition for "stack full"	4
		OR	
	(c)	Define a circular queue. Write the algorithm to insert and delete the elements in circular queue. What are the advantages of circular queue over simple queue?	12
3	(a)	Explain the idea of binary tree. The following binary tree has the following in-order and pre-order traversal. Draw the tree and give the post-order traversal. In-order **ABCEDFJGIH** Pre-order **JCBADEFIGH**	12
		OR	

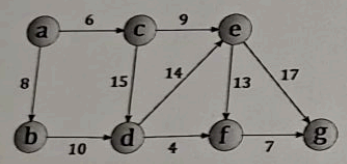
(b) Define the height balanced tree with its advantages. Insert following elements in AVL tree with suitable rotation operations. 12
[21, 26, 30, 9, 4, 14, 28, 18, 15, 0, 2, 3, 7]

4 (a) Write recursive algorithm of merge sort in suitable pseudo code. Explain working of algorithm via recursion tree method for following list of elements [4,6,1,2,4,5,3] 12

OR

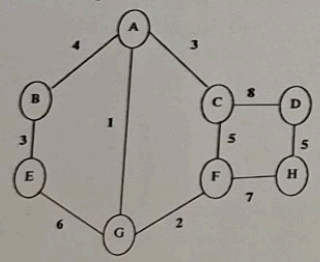
(b) Explain quick Sort algorithm with its best and worst cases of data pattern. Write stepwise process to sort the following elements using above algorithm. 12
[5, 6, 2, 1, 9, 6, 3, 8, 4, 7]

5 (a) Explain steps to find shortest path in the given graph from source node (a) to others, using Dijkstra's Algorithm. 12



OR

(b) Explain depth first search algorithm and do the traversal of the given graph using depth first search method starting from node A. 12



PART B – (40 Marks)

6 Explain the advantages of doubly linked list over single linked list. Write a pseudo code for insertion and deletion operations in doubly linked list. 8

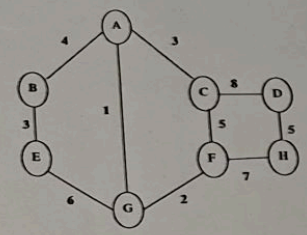
7 A circular queue has a size of 5 and has 3 elements 10, 20 and 40 where F=2 and R=4. After inserting 50 and 60, what is the value of F and R. Trying to insert 30 at

this stage what happens? Delete 2 elements from the queue and insert 70, 80 & 90. Show the sequence of steps with necessary diagrams with the value of F & R.

8 What is the meaning of collision in hashing? Explain collision resolution techniques in context of hashing. 8

9 Write short notes on algorithm design techniques: divide & conquer, greedy approach, and dynamic programming. Also explain which approach is appropriate in which situation: 8

10 What is a minimum spanning tree? Give Kristal's algorithm to find a minimum spanning tree. Determine the minimum spanning tree of the following graph; 8



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MID TERM EXAMINATIONS – September 2023

Programme	:	**B.Tech.**	Semester	:	**Fall 2023-24**
Course Title/ Course Code	:	**DATA STRUCTURES AND ANALYSIS OF ALGORITHMS / CSD3009**	Slot	:	**D21+D22+D23+D24**
Time	:	**1 ½ hours**	Max. Marks	:	**50**

Answer all the Questions

Q.No.	Sub. Sec.	Question Description	Marks
1		Explain about classification of Data Structure with specific industry example and suitable figure.	**10** 9
2		Develop a program for mark sheet processing using structure and array with specific procedure. Calculate the total, average, grade and display the results. Fields are: Regno, ds, dbms, java, python and cloud	**10** 8
3		Convert the following Infix notation to a Postfix notation using operator stack by maintaining a table consisting of **Current Symbol, Operator Stack and Postfix String.** The table should contain the entries corresponding to the stepwise evaluation of the procedure. Also, find out the maximum size of the operator stack during the evaluation. Given Infix Expression: a+b*c-(d*e+f)/g-(h+i)	**10** 8
4		Consider a stack implementation of browser history information with stores the domain name of 'n' activities. Write a program with necessary procedures that implements stack operations using linked list. i. Insert the activities, ii. Delete the activities, iii. Display the overall activities	**10** 7
5		Insert the following element in binary search tree and display each stages. 25, 27, 23, 29, 30, 24, 28, 30, 22, 26, 21. Delete the node 27, and 22 Write a program with necessary procedures.	**10** 6

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MID TERM EXAMINATIONS – September 2023

Programme	:	**B.Tech.**	Semester	:	**Fall 2023-24**
Course Title/ Course Code	:	**Engineering Design and Modelling / MEE2014**	Slot	:	**B11+B12+B13+B14**
Time	:	**1 ½ hours**	Max. Marks	:	**50**

Answer all the Questions

Q.No.	Sub. Sec.	Question Description	Marks
1		What are the Dieter Rams principles of good design? Apply them for a design of a comfort chair (as shown in below figure)	**10** 8
2	(a)	What is user experience (UX) and what are the objectives of this method. 2	**5**
	(b)	Students of VIT Bhopal are willing to appear in GATE examination in February 2023. What would be their approach for exam preparation using mind map 5	**5**
3		Apply the check list method of SCAMPER for a product shown below (new type of wrist watch) and showcase your views.	**10**
4		Explain the principles of biomimicry in architectural design to enhance the sustainability?	**10**
5		With a neat sketch and example distinguish between conceptual, embodiment and detailed design.	**10**

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TERM END EXAMINATIONS (TEE) – October - November 2023

Programme	:	**B.Tech.**	**Semester**	:	**Fall 2023-24**
Course Title/ Course Code	:	**Engineering Design & Modelling/ MEE2014**	**Slot**	:	**B11+B12+B13+B14**
Time	:	**3 Hrs.**	**Max. Marks**	:	**100**

Answer ALL the Questions

Q. No.		Question Description	Marks
		PART A – (60 Marks)	
1	(a)	What is Human-centered design? Describe how human centered design (HCD) has influenced the development of artificial intelligence.	12
		OR	
	(b)	Apply Engineering design process for design of racing car. Explain each step of the process with suitable diagram	12
2	(a)	What do You mean by Usability testing? Describe its core elements and objectives.	12
		OR	
	(b)	Explain the concept of metaphor in first order and higher order concept generation with suitable example.	12
3	(a)	Compare the stress-strain diagram for ductile and brittle material with neat and clean sketch.	12
		OR	
	(b)	Redesign a pen stand, using the principle of SCAMPER. Draw sketches to represent your modified design at various steps.	12
4	(a)	What is biomimicry? Explain the life cycle assessment for a Mobile phone with concept of sustainability.	12
		OR	
	(b)	Explain step by step procedure for additive manufacturing or 3D printing.	12
5	(a)	List and explain different mechanical properties of materials. (Note: Any 6 properties)	12
		OR	
	(b)	What do You mean by Engineering materials? Give a brief classification of engineering Materials with examples.	12

PART B – (40 Marks)

6	Apply the concept of k-script for the design of a new ticketing kiosk at a large fair.	8
7	Describe the 7 elements of storytelling for a perfect design communication.	8
8	Define stress and strain with the concept of Hook's Law.	8
9	What are the aids and barriers to creative thinking?	8
10	Write down the difference between blending and thematic method with examples.	8

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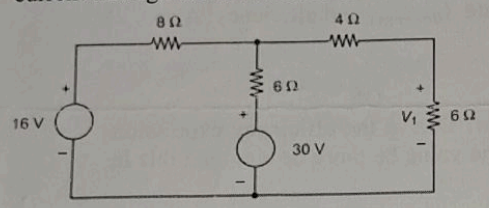
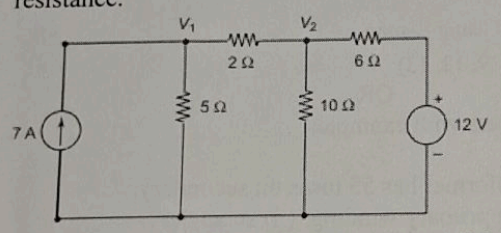
SUPPLEMENTARY EXAMINATIONS – August - September 2023					
Programme	:	B.Tech.	Semester	:	Winter Inter II / Winter Semester / Summer 2022-23
Course Name	:	Electric Circuit and System	Course Code	:	EEE1001
Faculty Name	:	Sadanand Singh Choudhary	Slot	:	NA
Time	:	3 Hrs.	Max. Marks	:	100

Answer ALL the Questions

Q. No.		Question Description	Marks
		PART A – (60 Marks)	
1	(a)	State Thevenin's theorem. Apply this theorem to calculate the current through the 8Ω resistor of the circuit of Fig.	7

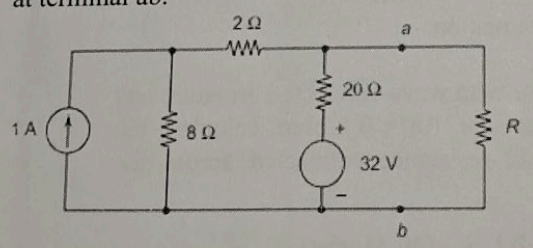


	(b)	Determine the nodal voltages and current through the 2 Ω resistance.	5



OR

	(c)	Find the Thevenin's and Norton's equivalents of the circuit of Fig. at terminal ab.	12



2 (a) A series RLC circuit containing a resistance of 10Ω, an inductance of 0.25H and a capacitor of 50uF are connected in series across a 100V, 50Hz supply. Calculate the total circuit impedance, the circuit's current, power factor and draw the voltage phasor diagram. 8

(b) Define magnetic circuit reluctance and how is it analogous to electric circuit resistance? 4

OR

(c) An linear time inverse continuous system is specified by 12

$$\frac{d^2y(t)}{dt^2} - 5\frac{dy(t)}{dt} + 6y(t) = \frac{dx(t)}{dt} + 2x(t)$$

The input is $x(t) = u(t)e^{-t}$

(i) Find natural response for initial condition

$$\frac{dy(0+)}{dt} = 0, y(0^+) = 1$$

(ii) Force response and total response.

3 (a) A full-wave bridge rectifier with an input of 100 V (rms) & f=50Hz. The input to a bridge rectifier is through a step down transformer of turn ratio 10:1. The load resistance is 1 kΩ secondary winding resistance of transformer is 4 Ω and diode forward resistances 2Ω. Calculate I_{dc}, I_{rms} and efficiency. Also draw the output wave form. 12

OR

(b) What is full –wave rectification? Derive the efficiency expression for a full-wave rectifier. Will the value be more or less than this in a half-wave rectifier? 12

4 (a) Draw and explain with excitation table the RS and JK flip-flop. 8

(b) Minimize the following expression using K-map. 4

$f(P, Q, R, S) = \Sigma m(0, 1, 3, 5, 7, 9, 12, 13)$

OR

(c) Explain Counter and shift registers with examples. 12

5 (a) A 40 kVA, 2200/400 volts transformer has 55 turns on secondary. Calculate (i) number of turns on primary winding; (ii) secondary current; (iii) the cross-sectional area of the core, if the maximum flux density is 1.2 Telsa. 12

OR

(b) Derived the transformer Emf equation. 4

(c) A four pole d.c. shunt generator with wave-connected armature has 40 slots and 12 conductors per slot. Ra = 0.5 ohm, calculate the voltage across a 1 ohms load resistance connected across the armature terminals. 8

PART B – (40 Marks)

6 Expain Maximum power tranfer theorem with suitable example. 8

7 Explain resonance in series RLC circuit with suitable example. 8

8 What are the three regions of operation of a BJT. Explain with help of CE configuration collector characteristics. 8

9 Design a 16 × 1 Multiplexer using 8× 1 and 2× 1 Multiplexers. Also write the truth table. 8

10 Explain DC motor with its classification. 8

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TERM END EXAMINATIONS (TEE) – January 2024

Programme	:	**B.Tech.[BET]**	**Semester**	:	**Interim 2023-24**
Course Title/ Course Code	:	**Foundations of Education Technology/ CET2001**	Slot	:	A14+E14+B14+F14+C14
Time	:	**3 Hrs.**	**Max. Marks**	:	**100**

Answer ALL the Questions

Q. No.		Question Description	Marks
		PART A – (60 Marks)	
1	(a)	Analyse the process of Defining Educational Technology with suitable Knowledge Modelling Diagrams and its Utilization in detail.	12
		OR	
	(b)	Classify the Technology support for Learning, Instruction and Performance.	12
2	(a)	Explain in detailed, step-by-step procedure for goal orientation on motivation.	12
		OR	
	(b)	Compare the performance of the methods to process Attribution theory and how student attributions are influenced.	12
3	(a)	Explain in detailed with suitable figure for the following i) Information and Information Theories ii) Communication and Communication Theories iii) Implications for Educational Technology	12
		OR	
	(b)	Apply and analyse the working of Instructional Theories and Instructional Design Theories with an example.	12
4	(a)	Derive the process of teaching with technology in practical application with suitable diagrams and implications.	12
		OR	
	(b)	Demonstrate the Integrating Technologies into Activities and Tasks with necessary diagrams.	12
5	(a)	Consider Professional Preparation and Training with the following structure: a) Leading Programs. b) Programmatic Changes. c) Professional Development.	12
		OR	
	(b)	Analyse the Case Study on Emerging Technologies for the Education sector.	12

PART B – (40 Marks)

6 Apply the concept of learning and performing, explain each of them in detail, and Write about the Foundation of Education Technology with six pillars and a network diagram. 8

7 Analyse the performance of the SELF-DETERMINATION THEORY in detail. 8

8 Apply and analyse the Theories of Learning and Performance with the suitable diagrams. 8

9 Explain in detailed with suitable figure for the following 8

i) Technology Needs
ii) Technology Readiness and Technology Deployment
iii) Management of Change

10 Apply the Educational Technology Principles and Examples in a Variety of Contexts. 8

a) K-12 Education
b) Communications and Interaction
c) Higher Education
d) Business and Industry

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MID TERM EXAMINATIONS – DECEMBER 2023

Programme	:	**B.Tech.**	Semester	:	**Interim 2023-24**
Course Title/ Course Code	:	**Foundations of Education Technology /CET2001**	Slot/ Class No	:	**A14+E14+B14+F14+C14/ 1023**
Time	:	**1 ½ hours**	Max. Marks	:	**50**

Answer all the Questions

Q.No.	Sub. Sec.	Question Description	Marks
1		Analyse the process of Defining Educational Technology with suitable Knowledge Modelling Diagrams and its Utilization in detail.	10
2	(a)	Apply the concept of learning and performing explain each of them in detail.	5
	(b)	Write the Foundation of Education technology with 6 pillars in detail?	5
3		Formulate in detailed, step-by-step procedure for goal orientation on motivation.	10
4		Evaluate the methods to process Attribution theory and how student attributions are influenced	10
5		Apply and analyse the Theories of Learning and Performance with the suitable diagrams.	10

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TERM END EXAMINATIONS (TEE) – January 2024

Programme	:	B.Tech.	Semester	:	Interim 2023-2024
Course Title/ Course Code	:	Applied Numerical Methods/ MAT2003	Slot	:	B21+E21+B22+E22+B23
Time	:	3 Hrs.	Max. Marks	:	100

Answer ALL the Questions

Q. No.		Question Description	Marks

PART A – (60 Marks)

1 (a) Nafisa invested her inheritance of Rs. 20,000 in three different investment options: real estate, stocks, and bonds. The real estate investment offers 6 % annual return, the stocks provide 10 % annual return, and the bonds yield 8 % annual return. She invested twice as much in stocks as in real estate. The total interest earned in one year was Rs. 2,024. How much did she invest in each type of fund? Write the system of linear equations corresponding to the given problem. Is your system solvable by Gauss-Seidel method? If yes, solve it. If not, provide justification and solve the system using the Gauss elimination method. 12

OR

(b) Consider the temperature control in a greenhouse using three heaters: Heater A, Heater B, and Heater C. The system of linear equations is given by: 12

$$\begin{aligned} 5x - 2y + z &= 12 \\ 2x + 8y - kz &= -18 \\ -x - 3y + 7z &= 24 \end{aligned}$$

(i) What condition on k ensures the system is diagonally dominant?

(ii) Explain the significance of the diagonally dominant property in solving the system.

(iii) Choose one value of k for which the system is diagonally dominant and use that value to solve the system by Gauss-Seidel method. Do your calculation till four iterations.

2 (a) What are Algebraic and Transnational Equations? Provide brief explanations of any two numerical methods, from your syllabus, used to solve these types of equations. Additionally, elucidate the reasoning behind learning multiple methods. 12

OR

(b) Find all roots of the equation $\cos x = x^2 + x$ correct to five decimal places. 12

3 (a) Let $P(x)$ be the interpolating polynomial for the data $(0,0),(0.5,a),(1,3),(2,2)$. Find a if the coefficient of x^3 in $P(x)$ is 6. 7

(b) If $f(x) = x^2$, find the divided difference $f[2,0,2,4]$. 5

OR

(c) Obtain the cubic spline fit for the data 12

x	0	1	2	3
$f(x)$	1	4	10	8

under the end conditions $f''(0) = 0 = f''(3)$ and valid in the interval $[1, 2]$. Hence, obtain the estimation of $f(1.5)$.

4 (a) Given $\log_{10} 654 = 2.8156$, $\log_{10} 656 = 2.8169$, $\log_{10} 658 = 2.8182$, $\log_{10} 660 = 2.8195$. Estimate $(655)^{-1}$. 8

(b) If the trapezoidal rule with single interval $[0, 1]$ is used for calculating the integral $\int_0^1 (x^3 - cx^2)\, dx$, then find the value of c. 4

OR

(c) (i) Obtain an approximate value of 12

$$I = \int_{-1}^{1} (1 - x^2)^{\frac{1}{2}} \cos x \, dx$$

using Gauss-Legendre two-point formula.

(ii) Estimate the integral

$$I = \int_{20}^{24} \frac{2x}{1 + x^4} dx$$

using the Gauss-Legendre three-point integration formula and compare it with the exact solution.

5 (a) The fourth order Runge-Kutta method is used to solve the initial value problem 12

$$\frac{dy}{dx} = y, y(0) = \alpha.$$

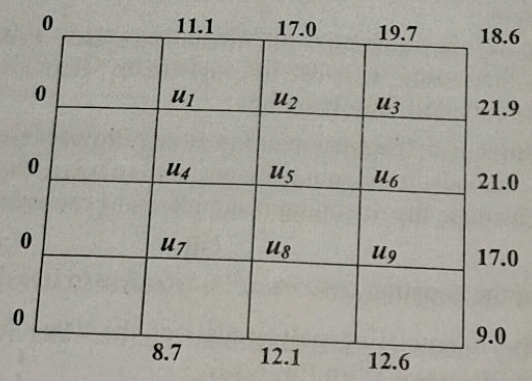
If $y(1) = 1$ is obtained by taking the step-size $h = 1$, then find the value of K_4. Also find $y(2)$.

OR

(b) Solve 12

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$$

at the nine mesh points of the square given below. The values of u at the boundary are specified in the figure.



PART B – (40 Marks)

6 In a circuit with three resistors connected in series, the voltage-drop across each 8

resistor is modelled by the following tridiagonal linear system of equations:

$$\begin{aligned} 2V_1 - 3V_2 &= 10 \\ -2V_1 + 7V_2 - 4V_3 &= 5 \\ -3V_2 + 6V_3 &= 8 \end{aligned}$$

Apply the Thomas Algorithm to find the voltage distribution across the resistors.

7 The current i in an electric circuit is given by $i = 10e^{-t}\sin 2\pi t$, where t is in seconds. Apply secant method to find the value of t correct to three decimal places for $i = 2$ amp. 8

8 From the following table, of half-yearly premium for policies maturing at different ages, estimates the premium for policies maturing at age 46. 8

Age x:	45	50	55	60	65
Premium y:	114.84	96.16	83.32	74.48	68.48

9 The velocity of a train which starts from rest is given by the following table, the time being reckoned in minutes from the start and the velocity in km/hour: 8

t	0	2	4	6	8	10	12	14	16	18	20
v	0	16	28.8	40	46.4	51.2	32	17.6	8	3.2	0

Using Simpson's $\frac{1}{3}$ rule, estimate the total distance run in 20 minutes. Determine whether Simpson's $\frac{3}{8}$ rule can be applied for estimating the total distance run in the same time duration. If it is applicable, employ Simpson's $\frac{3}{8}$ rule; If not, provide a justification for your answer.

10 Given the initial value problem 8

$$y' = x^2 + y^2, y(0) = 0$$

determine the first two non-zero terms in the Taylor series for $y(x)$ and hence obtain the value of $y(1)$.

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MID TERM EXAMINATIONS – December 2023

Programme	:	B.Tech.			
Course Title/Course Code	:	Applied Numerical Methods / MAT2003	Semester	:	Interim 2023-24
			Slot	:	B21+E21+B22+E22+B23
Time	:	1 ½ hours	Max. Marks	:	50

Answer all the Questions

Q.No.	Sub. Sec.	Question Description	Marks
1		The upward velocity of a rocket is given at three different times on the following table. Velocity vs. time data for a rocket	

Time, t (s)	Velocity, v (m/s)
5	106.8
8	177.2
12	279.2

The velocity data is approximated by a polynomial as $v(t) = at^2 + bt + c,\ 5 \le t \le 12.$ Set up the system of equations in matrix form and find the coefficients a, b, c of the velocity profile by Gauss elimination methods. **10**

2 Solve the following system of equations by Gauss-Seidel iteration method by starting with $x = 1, y = -2, z = 3$, perform four iterations. **10**

$$x + 3y + 52z = 173.61$$
$$x - 27y + 2z = 71.31$$
$$41x - 2y + 3z = 65.46$$

3 State the order of convergence and convergence condition for Newton's Raphson method and also obtain Newton's iterative formula for finding $\sqrt{N}$, where N is a positive real number. Hence evaluate $\sqrt{11}$. **10**

4 Find the real root of the equation $cosx = 3x - 1$ correct to five decimal places by fixed point iteration method. **10**

5 Using Lagrange's interpolation formula fit a polynomial to the following data. **10**

$y(0) = -12, y(1) = 0, y(3) = 6, y(4) = 12$. Hence, find $y(2)$.

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MID TERM EXAMINATIONS – March 2024

Programme	: **B.Tech.**	Semester	: **Winter 2023-24**
Course Title	: **Theory Of Computation And Compiler Design / CSE2004**	Slot	: **D11+D12+D13**
Time	: **1 ½ hours**	Max. Marks	: **50**

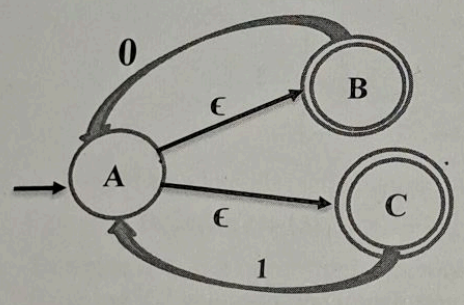
Answer all the Questions

Q.No.	Question Description	Marks
1	Explain DFA with its tuples. Consider a DFA having following transition table	

δ/Σ	a	b
→q_0	q_5	q_1
q_1	q_2	q_6
*q_2	q_2	q_0
q_3	q_2	q_5
q_4	q_5	q_7
q_5	q_6	q_2
q_6	q_4	q_6
q_7	q_2	q_6

Minimize the above DFA. '*' represents the final state. Draw the state transition diagram of minimum DFA. **10**

2 Convert the NFA with ϵ move into DFA. Represent the DFA by five tuples.



10

3 Explain grammar and its tuples. How CFG is different from RL?
Convert the following CFG to CNF, and describe each steps.

$S \rightarrow a \mid aA \mid B$

$A \rightarrow aBB \mid \varepsilon$

$B \rightarrow Aa \mid b$

10

4 Explain the concept of PDA with its tuples. Construct a PDA for following language: 1

$L = \{0^n 1^m \mid n >= 1, m >= 1, m > n+2\}$

5 Explain parsing in compiler. Describe types of parser. Construct parse tree for the string "bbaaaab" using the following grammar, and check the ambiguity. 10

$S \rightarrow AA$

$A \rightarrow AAA|bA|Ab|a$

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MID TERM EXAMINATIONS – April 2024

Programme	:	B.Tech.	Semester	:	Winter 2023-24
Course Title/ Course Code	:	Applied Linear Algebra/MAT3002	Slot	:	E11+E12
Time	:	1 ½ hours	Max. Marks	:	50

Answer all the Questions

Q.No.	Sub. Sec.	Question Description	Marks
1		For the matrix $A = \begin{bmatrix} 5 & -4 & 4 \\ 12 & -11 & 12 \\ 4 & -4 & 5 \end{bmatrix}$, examine if it is diagonalizable. Hence find the matrix P such that $P^{-1}AP$ is diagonal matrix and use P to evaluate A^{13}.	10
2		Examine if the the set of all triples of real numbers with the standard vector addition but with scalar multiplication defined by $$k(x,y,z) = (k^2x, k^2y, k^2z)$$ Forms a vector space.	10
3		Determine the basis and dimension of the null space of the system of equations: $$x_1 + 3x_2 - 2x_3 + 2x_5 = 0$$ $$2x_1 + 6x_2 - 5x_3 - 2x4 + 5x_5 - 3x_6 = 0$$ $$5x_3 + 10x_4 + 15x_6 = 0$$ $$2x_1 + 6x_2 + 8x_4 + 4x_5 + 18x_6 = 0$$	10
4		Verify Rank-Nullity Theorem for the matrix $$A = \begin{bmatrix} 1 & -3 & 4 & -2 & 5 & 4 \\ 2 & -6 & 9 & -1 & 8 & 2 \\ 2 & -6 & 9 & -1 & 9 & 7 \\ -1 & 3 & -4 & 2 & -5 & -4 \end{bmatrix}$$	10
5		Let $T: R^3 \longrightarrow R^3$ be a transformation defined as $$T(x_1, x_2, x_3) = (3x_1 + x_2, -2x_1 - 4x_2 + 3x_3, 5x_1 + 4x_2 - 2x_3)$$ a. Examine if T is a linear transformation. b. Examine if T is one-to-one transformation. c. Examine if T^{-1} exists. d. Determine the formula for T^{-1}.	10

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MID TERM EXAMINATIONS – April,2024

Programme	:	**B.Tech.**	Semester	:	**Winter 2023-24**
Course Title/ Course Code	:	**Programming in Java / CSE2006**	Slot	:	**B11+B12**
Time	:	**1 ½ hours**	Max. Marks	:	**50**

Answer all the Questions

Q.No.	Sub. Sec.	Question Description	Marks
1		What do you mean by object-oriented programming? What are its principles? Explain features of java that are supported by oops principles?	10
2		Write a following java program using flow control statements to get the value at run time. I. Given year is leap year or not. II. Given number is odd or even	10
3		Write a java program for bank details using multilevel inheritance for the variables such as to get accno, name, age, gender, acctype, total and display the balance, withdraw, deposit and annual interest.?	10
4		Write a java program for employee details using class and encapsulation to get empid, name, salary, PF and HRA. Find total salary for 'n' employees.?	10
5		Classify the types of exceptions and its java exception keywords with suitable example?	10

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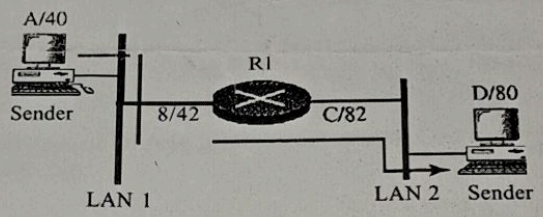
MID TERM EXAMINATIONS – April 2024

Programme	:	**B.Tech.**	Semester	:	**Winter 2023-24**
Course Title/ Course Code	:	**Computer Networks / CSE3006**	Slot	:	**B21+B22+B23**
Time	:	**1 ½ hours**	Max. Marks	:	**50**

Answer all the Questions

Q.No.	Sub. Sec.	Question Description	Marks
1	(a)	Explain the function and the protocols used for each layer in OSI reference model.	5
	(b)	In the shown figure, assume that the communication is between a process running at computer A (***IP address***-A, ***MAC address***-40) with port address *I* and a process running at computer D (***IP address***-D, ***MAC address***-80) with port address *J*. Show the contents of segments, packets and frames at the transport layer, network layer, data link for each hop.	5



2	(a)	List all the analog-to-digital conversion techniques, and explain PCM with suitable diagram.	5
	(b)	Explain various types of network topology with suitable diagram. For n devices in a network, what is the number of cable link required for mesh, ring, bus and star topology?	5
3		Given the dataword*1010011110* and the divisor x^4+x^2+x+1. a. Show the generation of the codeword at the sender site. b. Show the checking of the codeword at the receiver site (assume no error).	10
4		Discuss the operation of circuit switching, message switching, and packet switching?	10
5		Briefly describe the following networking devices working in relation to the OSI model: Hubs, Repeaters, Bridges, Switches, and Routers.	10

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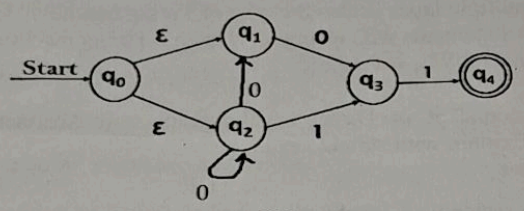
TERM END EXAMINATIONS (TEE) – July 2024

Programme	:	B.Tech.	Semester	:	Winter Semester 2023-2024
Course Title/ Course Code	:	Theory Of Computation And Compiler Design /CSE2004	Slot	:	D11+D12+D13
Time	:	3 Hrs.	Max. Marks	:	100

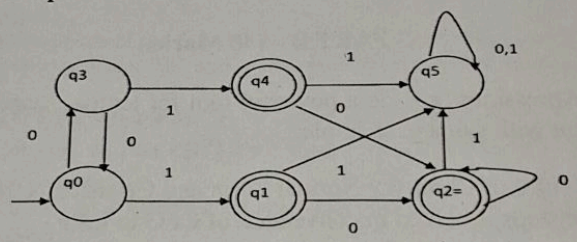
Answer ALL the Questions

Q. No.		Question Description	Marks
		PART A – (60 Marks)	
1	a	Eliminate ε from given transition diagram and design equivalent DFA. Explain each step clearly.	12



OR

	b	Describe the process of DFA to MDFA conversion. Convert following DFA to MDFA, and explain each step.	12



2	a	Explain the concept of Griebach Normal Form with its importance in compiler. Convert following CFG to GNF with proper explanation of each steps: $S \rightarrow XA \mid BB$ $B \rightarrow b \mid SB$ $X \rightarrow b$ $A \rightarrow a$	12

OR

	b	"Pushdown Automata is combination of finite automata and stack", justify the statement with example. Design pushdown automata to recognize the language, L defined by, $L = \{WcW^r \mid w \in \{a,b\}^*$ and W^r is the reverse of $W\}$.	12

3 a Explain Top-down Parsing approach in compiler. Describe the difference between recursive descent and non-recursive descent. Consider the following grammar, and prepare parsing table using LL(1) parser.

E --> TE'
E' --> +TE' | ε
T --> FT'
T' --> *FT' | ε
F --> id | (E)

OR

b Describe CLR Parser in compiler. Consider the following grammar, and prepare parsing table using CLR parser. 12

S →CC
C → cC
C → d

4 a Explain the concept of linear bounded Turing machine and universal Turing machine. Describe the operations with transactions that can be performed on universal Turing machine. Design a Turing machine for 2's complement of any binary number. 12

OR

b "TM with multiple tapes is also the type of Turing Machine" Give your views in detail on the given statements with example. Design a Turing machine for language L. 12
L={WaW and WbW}, w Є {a,b}*

5 a Discuss the concept of Direct acyclic graph and Abstract Syntax three in code generation. Explain with suitable example. 12

OR

b Describe the concept of Intermediate code generation in compiler in detail. Consider expression a = b * – c + b * – c. Convert it into Three address code and construct Quadruple, triple, and Indirect Triples. 12

PART B – (40 Marks)

6 "Regular expressions provide a powerful tool for textual search in computers" Justify the statement with suitable example. 8

7 Explain the rules of Chomsky Normal Form and Griebach Normal Form with example. Describe the steps involved in conversion of CFG to CNF. 8

8 Explain the working process and importance of YACC compiler. 8

9 Describe the Chomsky Hierarchy of languages with their rules to define the language. Take suitable example of each class of language. 8

10 Describe the concept of code optimization in detail. Discuss the role of dead code elimination and strength reduction during code optimization of a compiler, with example. 8

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TERM END EXAMINATIONS (TEE)– July 2024

Programme	:	B.Tech.	Semester	:	Winter Semester 2023-2024
Course Title/ Course Code	:	Applied Linear Algebra/ MAT3002	Slot	:	E11 + E12
Time	:	3 hours	Max. Marks	:	100

Answer all the Questions

Sr. No.	Question Description	Marks

PART A (60 Marks)

1. (a) Find the matrix P that diagonalizes the matrix $A = \begin{bmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$. (12)

OR

(b) Solve the given system of equation by Gaussian elimination. (12)

$$\begin{aligned} x_1 + 2x_2 + 3x_3 &= 5 \\ x_1 + 3x_2 + 6x_3 &= 3 \\ 2x_1 + 6x_2 + 13x_3 &= 5 \end{aligned}$$

2. (a) Examine if the set of all polynomials of the form $a_0 + a_1x + a_2x^2$, where $a_0, a_1, a_2 \in \mathbb{R}$, forms a vector space with operations of vector addition "$\oplus$" and scalar multiplication "$\cdot$" defined as (8)

$$\begin{aligned} (a_0 + a_1x + a_2x^2) + (b_0 + b_1x + b_2x^2) &= (a_0 + b_0) + (a_1 + b_1)x + (a_2 + b_2)x^2 \\ k \cdot (a_0 + a_1x + a_2x^2) &= (ka_0) + (ka_1)x + (ka_2)x^2. \end{aligned}$$

(b) Show that the set of all solutions of a homogenous system of equations $AX = 0$ of $m-$equations and $n-$unknowns forms a subspace of $\mathbb{R}^n$. (4)

OR

(c) Determine if the set $S = \{(1,2,3), (2,5,7), (1,3,5)\}$ is a linearly independent set of vectors in $\mathbb{R}^3$. If the set S is a linearly independent set of vectors in $\mathbb{R}^3$, can it be inferred that it is also a basis of $\mathbb{R}^3$? Justify your claim. (12)

3. (a) Among the given matrices $A_1 = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & -1 \end{bmatrix}$, $A_2 = \begin{bmatrix} 1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ and $A_3 = \begin{bmatrix} -1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$, which of them represents the reflection of the point $P(x, y, z)$ about the $xz-$plane? Hence, find the formula for the transformation $T : \mathbb{R}^3 \to \mathbb{R}^3$ describing the reflection of the point $P(x, y, z)$ about the $xy-$plane. Determine if T is linear one-to-one and onto transformation. (12)

OR

(b) For the transformation $T : \mathbb{R}^5 \to \mathbb{R}^3$ defined as $T(x_1, x_2, x_3, x_4, x_5) = (x_1 + x_2, x_2 + x_3 + x_4, x_4 + x_5)$, find the rank and nullity of the standard matrix for T.

4. (a) Let $W = \{\alpha_i : 1 \leq i \leq 4\}$ be a subspace of $\mathbb{R}^5$ spanned by the vectors α_i's, where $\alpha_1 = (1, 4, 5, 6, 9)$, $\alpha_2 = (3, -2, 1, 4, -1)$, $\alpha_3 = (-1, 0, -1, -2, -1)$ and $\alpha_4 = (2, 3, 5, 7, 8)$. Find a basis for orthogonal complement of W.

OR

(b) Show that the vectors $\mathcal{B} = \{(0, 2, 1, 0), (1, -1, 0, 0), (1, 2, 0, -1), (1, 0, 0, 1)\}$ forms an orthogonal basis of $\mathbb{R}^4$ with respect to the Euclidean inner product. Use $\mathcal{B}$ to find an orthonormal basis $\mathcal{B}'$ of $\mathbb{R}^4$. Hence find the coordinate vector of $(1, 1, 1, 1)$ relative to $\mathcal{B}'$. (1

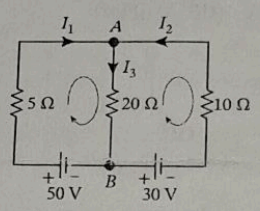
5. (a) Find the orthogonal projection of $\alpha = (1, -6, 1)$ on to the plane spanned by the vectors $\beta_1 = (-1, 2, 1)$ and $\beta_2 = (2, 2, 4)$. (12)

OR

(b) Let $\mathcal{B} = \{(1, 1, 1), (0, 1, 1), (0, 0, 1)\}$ a basis of $\mathbb{R}^3$. Using GramSchmidt method find an orthonormal basis of $\mathbb{R}^3$ relative to the basis $\mathcal{B}$. Hence find the QR decomposition of the matrix $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$. (12)

PART B (40 Marks)

6. Determine the current I_1, I_2 and I_3 in the circuit shown in the figure below. (8)



7. Verify Rank-Nullity theorem for matrix $A = \begin{bmatrix} 1 & 2 & -1 & -2 \\ -3 & 1 & 3 & 4 \\ -3 & 8 & 4 & 2 \end{bmatrix}$. (8)

8. Prove that the following identity holds for any vectors in any inner product space. (8)

$$||\alpha + \beta||^2 + ||\alpha - \beta||^2 = 2||\alpha||^2 + 2||\beta||^2$$

9. If $A + \begin{bmatrix} 2 & -3 \\ -1 & 4 \end{bmatrix}$ is the matrix of the transformation $T : \mathbb{R}^2 \to \mathbb{R}^2$. Examine if the transformation T is one-one and onto. Also find $T(1, 5)$. (8)

10. Find the singular values of the matrix $A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \\ 1 & 0 \end{bmatrix}$. (8)

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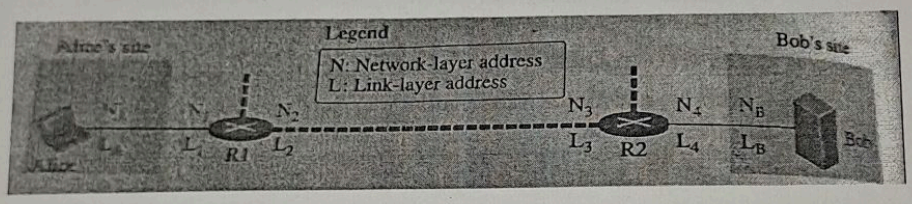
TERM END EXAMINATIONS-May 2024

Programme	:	B.Tech	Semester	:	Fall Semester 2023-24
Course Title	:	Computer Networks /CSE3006	Slot	:	B21+B22+B23
Time	:	3 Hrs.	Max. Marks	:	100

Answer ALL the Questions

Q. No.		Question Description	Marks
		PART A – (60 Marks)	
1	(a)	Explain why the TCP/IP model is more commonly used in modern networking as compared to the OSI model with each layer functions. Give explanation of different type of topologies in terms of its advantages and disadvantages.	12
		OR	
	(b)	In the figure assume that the communication is between a process running at computer Alice site with port address *i* and a process running at computer bob's site with port address *j*. Show the contents of segment, packets and frames at the transport layer , network layer and data link layer for each hop.	12



2	(a)	Analyze the efficiency of Go back-N ARQ and Selective Repeat ARQ protocols in scenarios with varying network conditions and packet loss rate. Explain with suitable diagrams.	12
		OR	
	(b)	A bit stream 1101011011 is transmitted using the standard CRC method. The generator polynomial is x^4+x+1. What is the actual bit string transmitted? Also comment on check sum technique to detect error with suitable example.	12
3	(a)	Explain the CSMA protocol and its different types. Consider a building with CSMA/CD network running at 1 Gbps over a 1 km cable with repeaters. The signal speed is 200 m/u sec. What is the minimum frame size?	12
		OR	
	(b)	Discuss the significance of classful IP addressing? For class B and class C IP addressing, determine total number of IP addresses, host, network, and range of first octet.	12
4	(a)	With a suitable practical scenario, elucidate the working ability and saliency of	12

congestion control techniques.

OR

(b) Analyze the working ability of TCP and UDP? Explicate role of multiplexing and de multiplexing in communication?

5 (a) Discuss the significance of cryptography and its types in computer network? 12

OR

(b) How a stateful session on a shopping cart application at amazon.com can be implemented by a stateless HTTP? What will be the security vulnerability in this approach? 12

PART B – (40 Marks)

6 Analyse the differences between ASK, PSK and FSK. List the shortcomings of each. 8

7 Discuss in brief the working principle of the packet switching with its types and suitable diagram. 8

8 Illustrate the creation of routing table in Distance vector routing algorithm using suitable example of router in a network. 8

9 Comment on significance of quality of services (QoS) and how to improve it in communication. 8

10 Explain the following (any 4): 8
(i) DNS (ii) SMTP (iii) Firewalls (iv)IGMP (v) FTP

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TERM END EXAMINATIONS (TEE) – May 2024

Programme	:	B.Tech.	Semester	:	Winter Semester 2023-24
Course Title	:	Programming in Java / CSE2006	Slot	:	B11+B12
Time	:	3 hours	Max. Marks	:	100

Answer All the Questions

Q. No.		Question Description	Marks
		PART A – (60 Marks)	
1	(a)	Why Java is platform independent language? Explain the list of OOPs Concepts in Java with suitable example.	12
		OR	
	(b)	Write a following Java program using Flow control statements to get the value at run time. I. Fibonacci series of a given count. II. Find the student grade calculation with Grade A, B, C and Fail	12
2	(a)	Write a java program for Library details using Interface for the data members like book_name,book_title, acctype, date and bal. Next to calculate the return date and fine amount if any, finally to display all the details.	12
		OR	
	(b)	Write a java program to define a class student with data members like name, rollno, age, gender, sub1, and sub2. Defines appropriate methods to initialize and displays the values of data members also calculates total marks, percentage and grade by the 'n' number of students?	12
3	(a)	What is exception? Write a java program to accept a password from the user and throw **"Authentication Failure"** exception if the password is incorrect.	12
		OR	
	(b)	Demonstrate the working of Thread Life Cycle model with suitable diagram and its Life Cycle methods with example.	12
4	(a)	Implement the matrix (3X3) addition using array with sample output.	12
		OR	
	(b)	Explain the following collection list interface statement and give example code.	12

I. ArrayList
II. Vector
III. Stack.

5 (a) Classify the Four types of JDBC drivers with neat diagram, advantages and disadvantages of each driver. 12

OR

(b) Summarize the need for Object-Relation Mapping (ORM) in details. 12

PART B – (40 Marks)

6 Write a java program to display all the odd numbers between 1 to 30 using for loop & if statement.? 8

7 What is a Constructor? Explain types of constructors in java? Write a java program to find the area of circle using constructor.? 8

8 What is multithreading? How does it improve performance of java explain with example code? 8

9 Write a Java program to add the letters, remove and find the size of the list using List interface with sample output. 8

10 Discuss with neat sketch for JPA Architecture in details. 8

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TERM END EXAMINATIONS (TEE) – August 2024

Programme	:	B.Tech.	Semester	:	Fall Semester 2024-2025
Course Name	:	Internet and Web Programming	Course Code	:	CSE4001
Date / Session	:	20 Aug 2024 / Session-I	Slot	:	A11+D11+A12+D12+A13
Time	:	3 Hrs.	Max. Marks	:	100

Answer ALL the Questions

Q. No.		Question Description	Marks
		PART A – (60 Marks)	
1	(a)	Compare and contrast client side scripting with server side scripting. In your answer you should mention some of the important technologies used for both types of scripting, and state the types of problems that each form of scripting is best suited for.	12
		OR	
	(b)	Define WWW? Describe the relationship between world wide web and internet? Describe the two tier architecture and components of WWW with neat and clean diagram?	12
2	(a)	What is table tag in html? Describe various attributes of HTML? Write a HTML program to display your 6th semester time table of your dept. using table tag?	12
		OR	
	(b)	Create a student course registration form (buttons, checkboxes, Labels and text input fields) using HTML forms tags with output.	12
3	(a)	Demonstrate with suitable example for three ways to construct array in JavaScript. Develop JavaScript program for 2*2 Matrix additions with output.	12
		OR	
	(b)	Demonstrate the need for JQuery. Write a JavaScript program to display the employee details using JQuery.	12
4	(a)	Describe how Ajax works with neat sketch. Write the suitable example for Request and Response with sample output.	12
		OR	
	(b)	Describe the concept of XQuery, Schema and DTD. Write a DTD code for students records like name, roll no, gender, age and mark with sample output.	12

5 (a) Create a student table in SQL, which includes Sname, Sroll, Sgrade, and S_Address, using the SQL command, and insert data into the student table using the PHP implementation. Write the PHP to MySQL database connectivity code to connect the student table with the output. 12

OR

(b) Demonstrate the need for PHP and PHP features with neat sketch in details. Write a factorial calculation program in PHP using recursion with output. 12

PART B – (40 Marks)

6 What is URL? What is the use of URL in web based application? Describe various parts of URL with one example of Facebook? 8

7 Classify the three ways to create CSS with an example and output. 8

8 Identify the need for Document Object Model with neat sketch and example. Demonstrate various methods of Document Object Model with output. 8

9 Differentiate HTML and XML. Discuss the XML Elements and Attributes with suitable example. 8

0 Differentiate Get and post method. Implement the event registration using PHP Form Handling operations with Get and post method with suitable output. 8

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TERM END EXAMINATIONS (TEE) – May 2024

Programme	:	**B. Tech**	Semester	:	**Winter Semester 2023-24**
Course Title/ Course Code	:	**Probability, Statistics and Reliability/ MAT3003**	Slot	:	**C11+C12+C13**
Time	:	**3 hours**	Max. Marks	:	**100**

Answer ALL the Questions

Q. No.		Question Description	Marks
		PART A – (60 Marks)	
1	(a)	A common test for AIDS is called the ELISA (enzyme-linked immunosorbent assay) test. Among 1 million people who are given the ELISA test, we can expect results similar to those given in the following table:	12

	B_1: Carry AIDS Virus	B_2: Do Not Carry Aids Virus	Totals
A_1: Test Positive	4,885	73,630	78,515
A_1: Test Negative	115	921,370	921,485
Totals	5,000	995,000	1,000,000

If one of these 1 million people is selected randomly, find the following probabilities: (a) $P(B_1)$, (b) $P(A_1)$, (c) $P(A_1 \mid B_2)$, (d) $P(B_1 \mid A_1)$. (e) In words, what do parts (c) and (d) say?

OR

(b) Bean seeds from supplier A have an 85% germination rate and those from supplier B have a 75% germination rate. A seed-packaging company purchases 40% of its bean seeds from supplier A and 60% from supplier B and mixes these seeds together. (i) Find the probability P(G) that a seed selected at random from the mixed seeds will germinate. (ii) Given that a seed germinates, find the probability that the seed was purchased from supplier A. 12

2 (a) In a casino, a player participates in a game of chance with the following rules: if a number less than 3 is rolled on a fair die, the player wins Rs. 60; if a number greater than 3 is rolled, the player loses Rs. 40; and if a 3 is rolled, the player receives nothing. Define the random variable X to represent the amount of money the player takes home. Express the probability function of the random variable X and illustrate it graphically. What is the expected amount of money the player takes home? 12

OR

(b) A candy maker produces mints that have a label weight of 20.4 grams. Assume that the distribution of the weights of these mints is $N(21.37, 0.16)$. Let X denote the weight of a single mint selected at random from the production line. Find $P(X > 22.07)$. 12

3 Let the random variables X and Y have the joint pmf

(a) $$f(x,y) = \frac{x+y}{32},\ x = 1,2,\ y = 1,2,3,4.$$ 12

Find the means μ_X and μ_Y, the variances σ_X^2 and σ_Y^2, and the correlation coefficient ρ.

OR

Let X and Y have the joint pdf

(b) $$f(x,y) = \left(\frac{4}{3}\right)(1-xy),\ 0 \le x \le 1,\ 0 \le y \le 1.$$ 12

Find the means μ_X and μ_Y, the variances σ_X^2 and σ_Y^2, and the correlation coefficient ρ.

4 Assume that IQ scores for a certain population are approximately $N(\mu, 100)$. To test $H_0: \mu = 110$ against the one-sided alternative hypothesis $H_1: \mu > 110$, we take a random

(a) sample of size $n = 16$ from this population and observe $\bar{x} = 113.5$. 12

(a) Do we accept or reject H_0 at the 5% significance level?

OR

The number of accidents in a factory during a year are given below:

(b)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
25	28	24	18	17	27	9	18	22	14	12	26

12

Using 5% level of significance, test the null hypothesis that the number of accidents does not depend on the month of the year.

5 Complete the ANOVA table:

(a)

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Sum of Squares	F-Value
Between Groups	—	—	MSB=_/_	F=__/MSE
—	—	$n-k$	__=_/_	
Total	SST=SSB+SSE	—		

12

OR

(b) Find the reliability function for series and parallel system 12

PART B – (40 Marks)

6 Two cards are drawn successively and without replacement from an ordinary deck of playing cards. Compute the probability of drawing

(i) Two hearts.

(ii) A heart on the first draw and a club on the second draw. 8

(iii) A heart on the first draw and an ace on the second draw.

7 An urn contains 7 red and 11 white balls. Draw one ball at random from the urn. Let $X = 1$ if a red ball is drawn and let $X = 0$ if a white ball is drawn. Give the pmf, mean, and variance of X. 8

8 The following data refer to hardness (in Rockwell units) of an alloy when 8 samples were treated at 500° C for different periods of time (in hours):

Time	6	9	12	15	21
Hardness	50	54	57	62	71

8

9 (a) Plot the scatter diagram. (b) Obtain the regression of hardness (Y) on the time (X).

A survey was conducted to investigate whether alcohol drinking and smoking are related. The following information was compiled on 600 individuals.

	Smoker	Non-smoker
Drinker	193	165
Non-drinker	89	153

8

Using 5% of level of significance, test the null hypothesis that alcohol drinker and smoking are not related.

10 Define mean time to failure (MTTF) and hazard function in context of reliability. 8

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TERM END EXAMINATIONS (TEE) – August 2024

Programme	:	B.Tech.[BAS]	Semester	:	Fall Semester 2024-2025
Course Name	:	Discrete Mathematics and Graph Theory	Course Code	:	MAT2002
Date/Session	:	27 Aug 2024/Session-II	Slot	:	B11+E11+B12+E12+B13
Time	:	3 Hrs.	Max. Marks	:	100

Answer all the Questions

Sr. No.	Question Description	Marks

PART A - (60 Marks)

1. (a) Show that $\neg r$ is a valid conclusion from the premises $p \to \neg q, r \to p, q$ (i) with truth table (ii) without truth table. (8)

   (b) Write the English sentence using the logical expression. (4)
   "You cannot ride the roller coaster if you are under 4 feet tall unless you are older than 16 years old"

   OR

   (c) Using laws of inference show that the premises "It is not sunny this afternoon and it is colder than yesterday," "We will go swimming only if it is sunny," "If we do not go swimming, then we will take a canoe trip," and "If we take a canoe trip, then we will be home by sunset" lead to the conclusion "We will be home by sunset". Mention each rule properly. (12)

2. (a) Let $S = \{1, 2, 3, \ldots, 18, 19\}$. Let R be the relation on S defined by xRy if and only if xy is a square, (12)
   (i) Prove R is an equivalence relation.
   (ii) Find the equivalence class [1].
   (iii) List all equivalence classes with more than one element.

   OR

   (b) Let $S = \{1, 2, 3, 4\}$.With respect to the lexicographic order based on the usual "less than" relation, (8)
   (i) Find all pairs in $S \times S$ less than (2, 3).
   (ii) Find all pairs in $S \times S$ greater than (3, 1).

(iii) Draw the Hasse diagram of the poset $(S \times S, \preceq)$.

(iv) Find the greatest and least element.

(c) Give an example of a poset which have (4)

(i) a maximal element but no minimal element.

(ii) a minimal element but no maximal element.

3. (a) Find DNF and CNF of the following Boolean function using algebraic technique (6)

$$f(x,y,z) = x + y(x+\bar{z}).$$

(b) Show that the Boolean function $F(x,y,z) = xy + xz + yz$ has the value 1 if and only if at least two of the variables x, y, and z have the value 1. (6)

OR

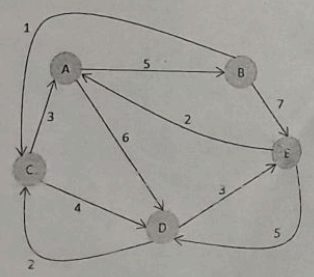
(c) Let A, B, C represent three switches in "ON" position and $\overline{A}$, $\overline{B}$, $\overline{C}$ represent the same three switches in "OFF" position. Construct a switching circuit representing the Boolean expression $(A+B)\cdot(\overline{A}+C)+B\cdot(\overline{B}+\overline{C})$. Using the laws of Boolean algebra, show that above expression is equivalent to $AC+B$ & construct a switching circuit. (12)

4. (a) Examine whether the graphs G and H associated with the adjacency matrices are isomorphic or not. (12)

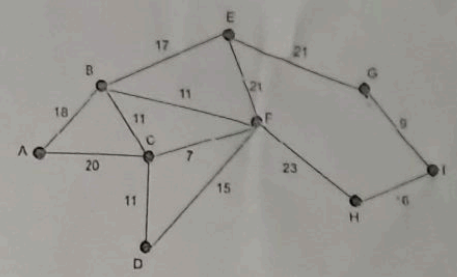
$$A_G = \begin{bmatrix} 0 & 1 & 1 & 1 \\ 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{bmatrix} \qquad A_H = \begin{bmatrix} 0 & 1 & 1 & 1 \\ 1 & 0 & 1 & 0 \\ 1 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \end{bmatrix}$$

OR

(b) Find the shortest path between all pair of vertices using Floyd-Warshall Algorithm in the graph below. (12)



5. (a) The diagram below represents a network of paths in a park. The number on each edge represents the length of the path in metres. Using Kruskal's algorithm find all possible minimal spanning tree for the network in the diagram and state its total length. (6)



(b) Define a binary tree. Show that the number of pendant vertices in a binary tree with n vertices is $\frac{n+1}{2}$. (6)

OR

(c) Find all nonisomorphic trees with four vertices. A tree has two vertices of degree 2, one vertex of degree 3 and three vertices of degree 4. How many vertices of degree 1 does it have? (12)

PART B - (40 Marks)

6. Determine the truth value of each of these statements if the domain of each variable consists of all real numbers. (8)

(i) $\forall x \exists y (x^2 = y)$

(ii) $\exists x \forall y (xy = 0)$

(iii) $\forall x (x \neq 0 \rightarrow \exists y (xy = 1))$

(iv) $\forall x \exists y (x + y = 1)$

7. Suppose that in a town, 800 people are selected by random types of sampling methods. 280 go to work by car only, 220 go to work by bicycle only and 140 use both ways – sometimes go with a car and sometimes with a bicycle. Answer the following questions (8)

(i) How many people go to work by car only?

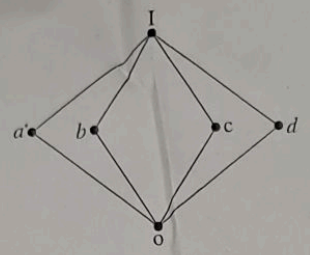
(ii) How many people go to work by bicycle only?

(iii) How many people go by neither car nor bicycle?

(iv) How many people use at least one of both transportation types?

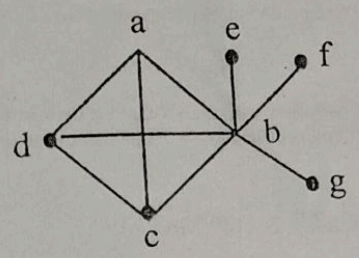
(v) How many people use only one of car or bicycle?

8. Show that the lattice L represented by the diagram below is complemented but not distributive. (8)



9. Characterize the graph on the basis of loops and multiple edges. Also, show that the maximum number of edges in a simple graph with n vertices is $\frac{n(n-1)}{2}$. (8)

10. Define cut vertices and cut edges . Find all the cut vertices and cut edges in the given graph. (8)



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MID TERM EXAMINATIONS – July 2024

Programme	:	B.Tech.	Semester	:	Winter 2023-2024
Course Title/Code	:	Discrete Mathematics and Graph Theory/MAT2002	Slot	:	B11+E11+B12+E12+B13
Time	:	$1_{1/2}$ hours	Max. Marks	:	50

Answer all the Questions

Sr. No.	Question Description	Marks
1.	Determine whether each of these arguments is valid. If an argument is correct, what rule of inference is being used? If it is not, what logical error occurs?	(10)
	(a) If you do every problem in this book, then you will learn discrete mathematics. You learned discrete mathematics. Therefore, you did every problem in this book.	
	(b) If n is a real number such that $n > 1$, then $n^2 > 1$. Suppose that $n^2 > 1$. Then $n > 1$.	
	(c) If n is a real number with $n > 3$, then $n^2 > 9$. Suppose that $n^2 \leq 9$. Then $n \leq 3$.	
	(d) If n is a real number with $n > 2$, then $n^2 > 4$. Suppose that $n \leq 2$. Then $n^2 \leq 4$.	
2.	(a) Show that $[\neg q \wedge (p \rightarrow q)] \rightarrow \neg p$ is a tautology by developing a series of logical equivalence.	(5)
	(b) Show that $\neg(p \vee (\neg p \wedge q))$ and $\neg p \wedge \neg q$ are logically equivalent by developing a series of logical equivalences.	(5)
3.	If R is the relation on the set of integers $\mathbb{Z}$ such that aRb if and only if $3a + 4b = 7n$ for some integers n, prove that R is an equivalence relation.	(10)
4.	Draw the Hasse diagram for $(S, \preceq)$, where $S = \{2, 3, 6, 12, 24, 36\}$ and $x \preceq y$ if and only if "$x \mid y$". Also	(10)
	(i) Find the least upper bound (lub) and greatest lower bound(glb) of $A = \{2, 3, 6\}$.	
	(ii) Find the least upper bound (lub) and greatest lower bound (glb) of $B = \{6, 12\}$.	
5.	Show that $(\mathbb{N}, \mid)$ is a partially ordered set. Determine whether the posets $(\{1, 2, 3, 4, 5\}, \mid)$ and $(\{1, 2, 4, 8, 16\}, \mid)$ are lattices by using closure table.	(10)

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MID TERM EXAMINATIONS – July 2024

Programme	:	B.Tech.	Semester	:	Fall Semester 2024-2025
Course Title	:	Database Management Systems	Course Code	:	CSE3001
Date/Session	:	20 July 2024/ Session I	Slot	:	A21+A22+A23+D21+D22
Time	:	1 ½ hours	Max. Marks	:	50

Answer all the Questions

Q.No.	Question Description	Marks
1	What is a *Data model*? Give the difference between a *Conceptual schema* and *External schema* of a database.	10
2	Assume an Educational institution scenario where we have Faculty, Courses, Departments, Class-rooms etc., with following description. A Faculty member can teach 0-3 courses. Each Course is taught by only one faculty. A course is taught in a class-room. Some class-rooms may not be allotted for any course. Each faculty member belongs to a Department. Courses are owned by departments. Each department can have zero to many courses. But each course is owned by only one department. Some faculty members head departments. One faculty can head more than one department and one department will have one and only one HOD. The characteristic features of Class-rooms are- roomID, capacity, block, LCD available status etc. Similarly for Faculty, attributes are- fid(unique), fname, fdesignation, fcontact. For Departments we need to store dname (Unique), dlocation details, and for Courses we need to capture courseID (unique), cname, credits, and text_book. Model the contact attribute of Faculty as a multivalued attribute, and model the text_book attribute of Course as a complex attribute that contains- title, author, publisher, price as sub-components. Now, draw the **ER** diagram for the above description. Indicate- cardinality, keys, attributes and participation constraints for entity-types involved in the relationships. Assume necessary data if found missing.	10
3	Give the difference between the *schema* and *instance* (*relation state*) of a relation, in relational model. What do select and project operations return when applied on a relation?	10
4	For each of the following relations with set of Functional Dependencies that hold on them, R1(A,B, C, D, E) { A →BCDE; CE→ ABD ; E→B} R2(A,B, C, D) { AB→C; AB→ D; D→B } Find: (i) Candidate keys (ii) The highest Normal Form satisfied	10

5 For the following Relational Database schema:

Student(sid, sname, sbranch)
Company(cid, clocation)
Offer(sid, cid, salary, joiningDate) **10**

Write SQL query to:

(i) Add a new column **cname** to Company relation representing company name.

(ii) Get the student_id for those students who have been offered jobs by a company whose cid is 5 .

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MID TERM EXAMINATIONS – July 2024

Programme	:	**B.Tech.**	Semester	:	**Fall Semester 2024-2025**
Course Title	:	**Machine Learning**	Course Code	:	**CSE4005**
Date/Session	:	***18 July 2024/ Session II***	Slot	:	**B21+B22+B23+E22**
Time	:	**1 ½ hours**	Max. Marks	:	**50**

Answer all the Questions

Q.No.	Sub. Sec.	Question Description	Marks
1		State the difference between supervised and unsupervised machine learning technique. Also to describe the examples of each technique.	10
2		Use the following data set to determine Perspectives of machine learning probabilities required to apply the mean, median, mode, Range and MSE, MAE. A) 24,19,11,12,17,5,8,12,14,23 B) 154,139,154,192,480,140,154,165,192,136,191,181	10
3		Make use of the following data Height <- c(131, 142, 148, 162, 182, 173, 197, 156, 145, 174) Weight <- c(58, 55, 49, 60, 57, 70, 91, 51, 50, 85) i)To finding linear regression relation between Height and Weight. ii) To finding the estimated weight of a new person coming with height 158.	10
4		Consider the following dataset.	10

Day	Weather	Temperature	Humidity	Wind	Play?
1	Sunny	Hot	High	Weak	No
2	Cloudy	Hot	High	Weak	Yes
3	Sunny	Mild	Normal	Strong	Yes
4	Cloudy	Mild	High	Strong	Yes
5	Rainy	Mild	High	Strong	No
6	Rainy	Cool	Normal	Strong	No
7	Rainy	Mild	High	Weak	Yes
8	Sunny	Hot	High	Strong	No
9	Cloudy	Hot	Normal	Weak	Yes
10	Rainy	Mild	High	Strong	No

Using ID3 Decision tree algorithm, Compute the probability and information gain of the following circumstances.

a) The person is ready to play if the weather is sunny, temperature is Hot, Humidity is High and Wind is String.

b) The person is not ready to play if the weather is cloudy, temperature is Mild, Humidity is Normal and Wind is Weak.

5		Elaborate the detail about K – Nearest Neighbours classification techniques with sample data set with Pseudocode	10

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MID TERM EXAMINATIONS - July 2024

Programme	:	B.Tech.	Semester	:	Fall Semester 2024 - 25
Course Title	:	Database Management Systems	Course Code	:	CSE3001
Date/Session	:	19 July 2024/ Session II	Slot	:	B21+B22+B23+E21+E22
Time	:	1 ½ hours	Max. Marks	:	50

Answer all the Questions

Q.No.	Sub. Sec.	Question Description	Marks
1		Illustrate the database system architecture by drawing a detailed diagram that explains each component.	10
2		A university registrar's office manages information regarding the following entities: a) Courses, which include details such as number, title, credits, syllabus, and prerequisites b) Course offerings, encompassing course number, year, semester, section number, instructor(s), timings, and classroom c) Students, with attributes like student ID, name and programme d) Instructors, covering identification number, name, department and title. Additionally, it is essential to properly model the enrollment of students in courses and the grades awarded to students for each course they are enrolled in. Construct an E-R diagram for the registrar's office and document any assumptions made about the mapping constraints.	10
3		Enumerate the fundamental operators and syntax of relational algebra, explaining the purpose of each with examples.	10
4	(a)	Discuss First Normal Form (1NF) and Second Normal Form (2NF) in detail, providing suitable examples for each to illustrate their concepts and requirements.	5
	(b)	Consider the relation R = {A, B, C, D, E, F, G, H, I, J} and the set of functional dependencies F = {{A, B} → {C}, {B, D} → {E, F}, {A, D} → {G, H}, {A} → {I}, {H} → {J}}. a) Identify the keys of *R* b) Decompose R into Second Normal Form (2NF).	5

c) Further decompose the 2NF relations into Third Normal Form (3NF).

5 Consider the bank database, where the primary keys are underlined. 10

branch (branch_name, branch_city, assets)
customer (customer_name, customer_street, customer_city)
loan (loan_number, branch_name, amount)
borrower (customer_name, loan_number)
account (account_number, branch_name, balance)
depositor (customer_name, account_number)

Construct the following SQL queries for this relational database:

a) Write the SQL statements required to create these relations.
b) Find all customers of the bank who have an account but not a loan.
c) Find the names of all customers who live on the same street and in the same city as "William".

Find the names of all branches with customers who have an account in the bank and who live in "Bhopal".

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MID TERM EXAMINATIONS – April 2024

Programme	:	B.Tech.	Semester	:	Winter 2023-24
Course Title/ Course Code	:	Digital Logic Design / ECE2002	Slot	:	B21+B22+B23
Time	:	1 ½ hours	Max. Marks	:	50

Answer all the Questions

Q.No.	Sub. Sec.	Question Description	Marks
1	(a)	Convert decimal 27.315 to binary. Then find the octal and hexadecimal for the converted number.	5
	(b)	Perform subtraction on the given unsigned binary numbers using the 2's complement of the subtrahend. (i) 10011-10010 (ii) 100010-100110	5
2	(a)	Convert the following SOP and POS expressions into canonical form (i) AB'+BC'+ABC'+A'C (ii) (A'+B) (A'+B+C'+D')	5
	(b)	Implement a half adder with basic logic gate from its Truth Table	5
3		Using K-map method, Reduce the following Boolean function $F=\Sigma_m (0,2,3,6,7) + d (8,10,11,15)$ and obtain minimal SOP.	10
4		Implement the following Boolean function with a 4 x 1 multiplexer and external gates. $F(A, B, C, D) = \sum (1, 3, 4, 11, 12, 13, 14, 15)$ Connect inputs A and B to the selection lines. The input requirements for the four data lines will be a function of variables C and D. These values are obtained by expressing F as a function of C and D for each of the four cases when AB = 00, 01, 10, and 11. These functions may have to be implemented with external gates.	10
5		Compare and explain the SR and D latch with neat sketch.	10

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MID TERM EXAMINATIONS – August 2022

Programme	: B.Tech/Int.Mtech[BAI,MIP, MIM]	Semester	: Fall 2022-23
Course	: Database Management systems	Code	: CSE3001
Faculty	: Dr. Hariharasitaraman.S	Slot/ Class No.	: E21+E22+E23/0437
Time	: 1 ½ hours	Max. Marks	: 50

Answer all the Questions

Q.No.	Sub. Sec.	Question Description	Marks
1		Describe Database Management Language, Data Definition Language and Data Control language and list any five SQL commands associated with it.	10
2		Design an Entity Relationship Diagram for Database Schema which suits VIT University, Choose Entities, Attributes and Relationships as per your choice	10
3		Consider the given Course table and Program Chair table. Apply and find the resultant tables using Right Outer Join, Left Outer Join, Full Outer Join, Equi Join and SET Difference operation.	10

Table: Course

Course Code	Course Name	Department
CS01	Database	CS
ME01	Mechanics	ME
EE01	Electronics	EE

Table: Program Chair

Department	Program Chair	Course Name
CS	Alex	Database
ME	Ruban	Mechanics
EE	Xavier	Electronics

Q.No.	Sub. Sec.	Question Description	Marks
4		Decompose the following relation with First Normal Form (1NF), 2NF, 3NF and BCNF.	10

FULL NAMES	PHYSICAL ADDRESS	MOVIES RENTED	SALUTATION
Janet Jones	First Street Plot No 4	Pirates of the Caribbean, Clash of the Titans	Ms.
Robert Phil	3rd Street 34	Forgetting Sarah Marshal, Daddy's Little Girls	Mr.
Robert Phil	5th Avenue	Clash of the Titans	Mr.

Q.No.	Sub. Sec.	Question Description	Marks
5		Write the mySQL query for the given scenario, Assume there are tables like EMPLOYEE, DEPARTMENT, DEPT_LOCATIONS, WORKS_ON, PROJECT, and DEPENDENT tables that exist in a database.	10

a) For each employee, retrieve the employee's first and last name and the first and last name of his or her immediate supervisor.
b) Retrieve all employees whose address is in Houston, Texas.
c) For each employee, retrieve the employee's first and last name and the first and last name of his or her immediate supervisor.

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MID TERM EXAMINATIONS – July 2024

Programme	:	**B.Tech.**	Semester	:	**Fall 2024-25**
Course Title & Code	:	**Database Management Systems/CSE3001**	Slot	:	**A24+B24+E23+F21+F22**
Time	:	**1 ½ hours**	Max. Marks	:	**50**

Answer all the Questions

Q.No.	Sub. Sec.	Question Description	Marks
1		Design an ER diagram for a university database system that includes the following entities and relationships: • Student (StudentID, Name, DateOfBirth, Address) • Course (CourseID, Title, Credits) • Enrollment (StudentID, CourseID, EnrollmentDate) • Department (DeptID, DeptName) • Instructor (InstructorID, Name, DeptID) Include appropriate attribute types, primary keys, relationships between entities, and identify any weak entities.	10
2	(a)	Discuss the different types of Database Management System architectures?	5
	(b)	Illustrate the importance of data independence in a database system and differentiate between physical data independence and logical data independence	5
3		Consider the following relations for a university database: **Student (SID, Name, Age, Major)** **Course (CID, Title, Department)** **Enrollment (SID, CID, Grade)** Using the relations above, express the following queries in relational algebra: 1. List the names of students who are enrolled in the 'Computer Science' department courses. 2. Find the titles of courses that have been taken by at least one student majoring in 'Mathematics'. 3. Retrieve the student IDs and names of students who have received a grade of	10

'A' in any course.

4. Get the list of all students (by name) who are not enrolled in any course.
5. List the names and majors of students along with the titles of courses they are enrolled in.

4 Assume you are building a restaurant management application. That application needs to store data about the company's employees, and it starts out. 10

EMP_ID	NAME	JOB_CODE	JOB	STATE CODE	HOME_STATE
1001	Alice	JC101	Chef	23	MP
1001	Alice	JC102	Waiter	23	MP
1002	Bob	JC102	Waiter	27	Maharashtra
1002	Bob	JC103	Bartender	27	Maharashtra
1003	Alice	JC101	Chef	27	Maharashtra

Decompose the table into the following normal form 1NF, 2NF & 3NF.

5 **Write SQL Queries for the following: -** 10

1. Create a table named Books with the following attributes
Books (BookID, Title, Author, Publication year, Price)
2. Insert three records into the Books table:

- BookID: 1, Title: 'The Great Gatsby', Author: 'F. Scott Fitzgerald', PublicationYear: 1925, Price: 10.99
- BookID: 2, Title: 'To Kill a Mockingbird', Author: 'Harper Lee', PublicationYear: 1960, Price: 12.50
- BookID: 3, Title: '1984', Author: 'George Orwell', PublicationYear: 1949, Price: 9.95

3. Write a SQL query to retrieve all books from the Books table, sorted by Price in descending order.
4. Update the price of the book with BookID 2 to 14.99.
5. Delete the book with BookID 3 from the Books table.

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SUPPLEMENTARY EXAMINATIONS – August - September 2023

Programme	:	**B.Tech.**	**Semester**	:	**Winter Inter II / Winter Semester / Summer 2022-23**
Course Name	:	**Calculus and Laplace Transform**	**Course Code**	:	**MAT1001**
Time	:	**3 Hrs.**	**Max. Marks**	:	**100**

Answer ALL the Questions

Q. No.		Question Description	Marks
		PART A – (60 Marks)	
1	(a)	Check the continuity of the given functions at origin: $$f(x,y)=\begin{cases}\dfrac{x}{\sqrt{x^2+y^2}}, & \text{if } (x,y)\neq(0,0)\\ 0, & \text{if } (x,y)=(0,0)\end{cases}$$	6
	(b)	If $f=f\,(y-z,\ z-x,\ x-y)$, prove that $$\frac{\partial f}{\partial x}+\frac{\partial f}{\partial y}+\frac{\partial f}{\partial z}=0.$$	6
		OR	
	(c)	Find the maximum and minimum values of the function $$f(x,y)=x^3+3x^2+y^2+4xy.$$	
2	(a)	Sketch the region and change the order of the integration in $$I=\int_0^1\int_x^1\frac{x}{\sqrt{x^2+y^2}}\,dy\,dx.$$	
	(b)	Evaluate $$I=\iint xy\,dx\,dy,$$ over the area bounded by first quadrant of the circle $x^2+y^2=a^2$.	6
		OR	
	(c)	Find the volume bounded by the cylinder $x^2+y^2=4$ and the plane $y+z=4$ and $z=0$.	12
3	(a)	Find the directional derivative of $f(x,y)=x^2y^3+xy$ at $(2,1)$, in the direction of a unit vector which makes an angle of $60°$ with x −axis.	12
		OR	

(b) Verify Stoke's theorem for the vector field $\vec{F} = (3x - y)i - 2yz^2j - 2y^2zk$ over the surface of the sphere $x^2 + y^2 + z^2 = 16$ bounded by its projection on xy –plane. 12

4 (a) Solve the equation 6

$$L\frac{di}{dt} + Ri = E_0 \sin t\,,$$

where L, R and E_0 are constants.

(b) Solve the initial value problem 6

$$y'' + 6y' + 9y = 0, \text{ with } y(0) = 2, y'(0) = 3.$$

OR

(c) Using the method of variation of parameters, solve the given differential equation 12

$$\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = e^x \log x.$$

5 (a) Solve the given differential equation 12

$$y'' + 9y = 6\cos 3t, y(0) = 2, y'(0) = 0,$$

by using Laplace transform.

OR

(b) Find the Laplace transform of 4

$$f(t) = \int_0^t \frac{\sin at}{t} dt.$$

(c) Using the convolution theorem find the inverse Laplace transform of the given function 8

$$f(s) = \frac{1}{(s+2)^2(s-2)}.$$

PART B – (40 Marks)

6 Obtain Taylor's expansion of $e^x \cos y$ about $(0, \frac{\pi}{2})$ upto second degree terms. 8

7 Transfer the integral to Cartesian form and hence evaluate 8

$$I = \int_0^{\pi}\int_0^{1} r^3 \sin\theta \cos\theta \, dr \, d\theta.$$

8 Using Green's theorem, evaluate 8

$$\oint_C \{(x^2 + y^2)dx + (y + 2x)dy\},$$

where C is the boundary of the region in the first quadrant that is bounded by the curves $x^2 = y$ and $y^2 = x$.

9 Solve the differential equation 8

$$x^2\frac{d^2y}{dx^2} - x\frac{dy}{dx} + y = \log x.$$

10 Find the Laplace transform of 8

$$f(t) = t\,e^{-t}\sin 2t.$$

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TERM END EXAMINATIONS – January 2024

Programme	:	**B.Tech**	**Semester**	:	**Interim 2023-24**
Course Title/ Course Code	:	**Python Programming/CSE3011**	**Slot**	:	**A21+D21+A22+D22+A23**
Time	:	**3 Hrs.**	**Max. Marks**	:	**100**

Answer ALL the Questions

Q. No.		Question Description	Marks

PART A – (60 Marks)

1 (a) "Strings in python are immutable", justify this statement with suitable example. Write a python program to create a string containing an integer, then convert that string into the actual integer object using **int()**. Test your new object is a number by multiplying it by another number and display the number. 12

OR

(b) Write a python program to take two user input (integer data) and perform the following operations on them and display the result. 12

Operator	Meaning
&	Bitwise AND
|	Bitwise OR
~	Bitwise NOT
^	Bitwise XOR
>>	Bitwise right shift
<<	Bitwise left shift

2 (a) Describe the scope of a variable ? Illustrate the different types of scope with examples. 12

For the bellow mentioned python code justify the output:

```
a=20
b=30
def display():
    Global a
    a=30
    print(' The value of a and b inside function is:',a,b)
display()
print(' The value of a and b outside function is:',a,b)
```

OR

(b) Write a function is_Palindrome(), which takes a list of integers as parameter to check 12

whether the list is palindrome or not.
i) It should return the total summation of the list elements if list is palindrome otherwise,
ii) it returns 0.

3 (a) Describe the process of operator overloading in Python. Elucidate the process of binary "+" operator overloading with a suitable Python code. 12

OR

(b) Write a simple program to demonstrate the concept of multilevel inheritance. 12

4 (a) Write a Python program to read two files consecutively and write the contents into another file. 12

OR

(b) What is shutil module? Write a Python program using shutil module to organize the different files in a specific folder. 12

5 (a) Design the window given bellow in Fig. 1 by using the .pack() of tkinter module. 12

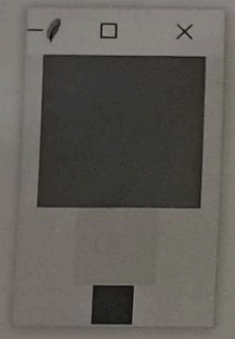

Fig 1: Window

OR

(b) What is a Thread ? List the information maintained by a Thread in Thread Control Block (TCB). 12
Write a Python program to
i. Import the module for threading.
ii. Create a Thread.
iii. Start a Thread.
iv. End the Thread exeution.

PART B – (40 Marks)

6 What are the different control flow statements in Python? Explain with proper examples. 8

7 Illustrate the Match Object methods of regex function by considering a suitable example. 8

8 "We can have any number of **except** clauses after a try block. However, you can catch the exception specifically raised by a piece of code by monitoring it with the except". Justify the statement with a suitable example. 8

9 Let us consider there is MySql database named "Hospital". Write a Python code to create a database table "Doctor" with attributes (Doctor_Id, Doctor_Name, Hospital_Id, Joining_Date, Speciality, Salary, Experience) and insert the bellow mentioned data into the table. 8

Doctor_Id	Doctor_Name	Hospital_Id	Joining_Date	Speciality	Salary	Experience
101	David	1	2005-02-10	Pediatric	40000	NULL
102	Michael	1	2018-07-23	Oncologist	20000	NULL
103	Susan	2	2016-05-19	Gamacologist	25000	NULL
104	Robert	2	2017-12-28	Pediatric	28000	NULL
105	Linda	3	2004-06-04	Gamacologist	42000	NULL
106	William	3	2012-09-11	Dermatologist	30000	NULL
107	Richard	4	2014-08-21	Gamacologist	32000	NULL
108	Karen	4	2011-10-17	Radiologist	30000	NULL

10 Describe the key characteristics of Client/ Server Communication. 8

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TERM END EXAMINATIONS (TEE) – October - November 2023

Programme	:	**B.Tech.**	**Semester**	:	**Fall 2023-24**
Course Title	:	**Engineering Chemistry/ CHY1001**	**Slot**	:	**A22+A23+D21+D22**
Time	:	**3 Hrs.**	**Max. Marks**	:	**100**

Answer ALL the Questions

Q. No.	Question Description	Marks
	PART A – (60 Marks)	
1	(a) The hardness of 1000 litre of raw water was reduced to 2 ppm after passing through styrene-divinylbenzene copolymer which is capable of exchange cation and anion present in water and got exhausted. Write an explanatory note on the softener construction, working and the chemical reaction involved in the softening process and regeneration process	12
	OR	
	(b) Water treatment is any process that improves the quality of water to make it appropriate for a specific end-use. The end use may be drinking, industrial water supply, irrigation, river flow maintenance, water recreation or many other uses, including being safely returned to the environment. Discuss the various steps involved in treatment of water for domestic/municipal purpose.	12
2	(a) The ice in glaciers always starts melting from which part of the top surface, the middle layers, or the bottom layer? Explain by drawing the necessary Phase diagram?	12
	OR	
	(b) An alloy of Component A and Component B which do not react but miscible in all proportions in molten state is used to manufacture "Fail Safe" devices for boiler. Narrate the effect of composition on equilibrium: Solid ↔ Liquid if the melting point of A (916°C) and B (327°C).	12
3	(a) Consider an electrochemical cell Mg | Mg^{2+} ‖Cd^{2+} |Cd, calculate the voltage of the cell at 25 ^{0}C, when $[Cd^{2+}]$ = 7x 10^{-11} M and $[Mg^{2+}]$ = 1 M. Standard electrode potential of the cell = 1.97 V	12
	OR	
	(b) Why would pitting corrosion be much more prone to provoke a catastrophic failure than uniform corrosion generally does	12
4	(a) In an old Car, a lead-acid battery was in use, for 8 months car was not used by the owner and after few days he felt that the battery performance is not adequate. Explain the construction and the working of this battery. Also explain why it is necessary to follow discharging-charging cycle for better performance of the battery with chemical reaction involved in it.	12

OR

(b) How to build a safer, more energy-dense Lithium-ion Battery? Discuss three types of constructions to achieve this goal with proper illustrations. 12

5 (a) With a neat sketch explain the measurement of calorific value by Boy's gas calorimeter. 12

OR

(b) Write a brief account of the classification and importance of polymer 12

PART B – (40 Marks)

6 While using the lime-soda process of water treatment, you've used excess of Na_2CO_3. What could be the implications of excess of Na_2CO_3 ?Enumerate the remedies for problems caused by Na_2CO_3 8

7 Account for the differences between water and CO_2 phase diagrams although both are one-component systems. 8

8 A copper made equipment is to be used in corrosive environment. Based on your knowledge of galvanic series, suggest how we can protect this copper equipment from getting corroded. 8

9 Discuss the history of battery in the light of specific energy, advantages and disadvantages. 8

10 Explain in detail about Calorific value, LCV and HCV. 8

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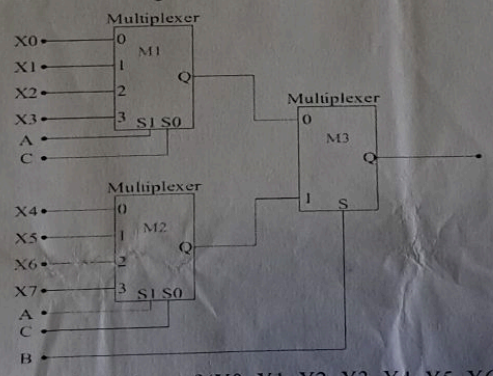
TERM END EXAMINATIONS (TEE) – May 2024

Programme	:	**B.Tech.**	**Semester**	:	**Winter Semester 2023-24**
Course Title/ Course Code	:	**Digital Logic Design / ECE2002**	**Slot**	:	**C21+E21+F22**
Time	:	**3 Hrs.**	**Max. Marks**	:	**100**

Answer ALL the Questions

Q. No.		Question Description	Marks
		PART A – (60 Marks)	
1	(a)	1. Express the following numbers in decimal: (i) $(16.5)_7$ (ii) $(DADA.B)_{16}$ 2. Subtract 346.6_{10} from 1234.5_8 using 9's and 10's complement.	12
		OR	
	(b)	1. The solution of equation $x^2 - 12x + 37 = 0$ is x=8 in some base r. Find the value of r. 2. Convert F=A'B+AC' into Sum of min terms (SOP) and product Of Max terms (POS).	12
2	(a)	Reduce the expression using K-map and determine the number of Essential Prime Implicants. F=$\sum m(0,2,5,7,8,10,12,13,14,15)$	12
		OR	
	(b)	Consider the Logic circuit below:  Determine values of (X0, X1, X2, X3, X4, X5, X6, X7) to realise the Boolean function A'+A'C'+AB'C?	12

(a) A synchronous circuit consist of two inputs X and Y, two D flip flop, A and B and one output Z. The state (input) equations are given below. 12

A(t+1)=X'Y+XA, B(t+1)=X'B+XA, Z=B

Draw the logic diagram, state table and state diagram.

OR

(b) Find the equivalence partition from given state table. Convert the reduced machine into a Moore machine.

3

P.S.	N.S., Output	
	X = 0	X = 1
A	B, 1	H, 1
B	F, 1	D, 1
C	D, 0	E, 1
D	C, 0	F, 1
E	D, 1	C, 1
F	C, 1	C, 1
G	C, 1	D, 1
H	C, 0	A, 1

12

4 (a) Design a 3 bit Synchronous UP counter using JK flip flop, consider positive edge triggering. Draw the state Table and justify the counting using a timing diagram. Also evaluate the frequency of the output signal. 12

OR

(b) Based on the input-output relationship provided, determine the pattern detected by the sequence detector. Additionally, create a Mealy machine for the same utilizing D flip-flops. 12

Input Pattern : 11011011011

Output Pattern : 00001001001

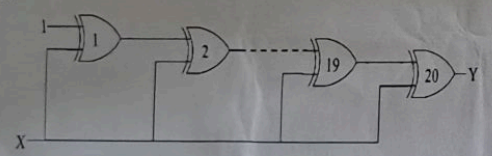
5 (a) What are the different Gate Level primitives in Verilog. Write a Gate level design the function F=AB'+A'B. Considering gate delays as under: AND Gate: 20ns, OR Gate: 20 ns and NOT Gate: 10 ns. 12

OR

(b) What are the various types of Verilog modelling and for what purposes would each be suitable? 12

PART B – (40 Marks)

6 The digital circuit consist of 20 Ex-OR Gates. Determine the output Y. 8



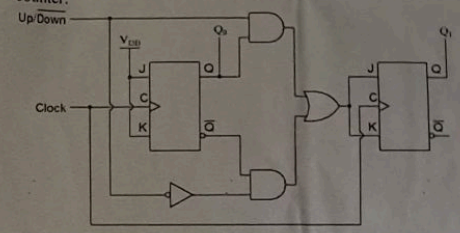
7 Perform the given arithmetic operation using both Excess-3 and BCD addition. 8

984+599=?

8 Determine the excitation table of a some XY FF if its truth table is given as: 8

X	Y	Q(t+1)
0	0	1
0	1	Q(t)
1	0	Q(t)'
1	1	0

9 The following circuit is a two-bit synchronous binary up/down counter: 8



Explain what would happen if the upper AND gate's output were to become "stuck" in the high state regardless of its input conditions. What effect would this kind of failure have on the counter's operation?

10 Write a Verilog code in Behavioural modelling style for 4X1 Multiplexer. 8

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4, 10)
5, 12, 13)

as initially cleared
so draw the block 8

10" from an FSM
ith "b" as external

quired.

8

ull adder (FA) 8

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TERM END EXAMINATIONS – July 2024

Programme	:	B.Tech.	Semester	:	Winter Semester 2023-24
Course Title/ Course Code	:	Digital Logic Design/ ECE2002	Slot	:	A14+F11+F12
Time	:	3 Hrs.	Max. Marks	:	100

Answer ALL the Questions

Q. No.		Question Description	Marks

PART A – (60 Marks)

1 (a) Perform following operations using 2's complement form assuming numbers are represented in an 8-bit computer and also verify your answer: 12

(i) $-12_{10} - 3_{10}$.

(ii) $-32_{10} - 3_{10}$.

(iii) $-127_{10} - 3_{10}$

(iv) $103.08_{10} - 14.25_{10}$

OR

(b) Reduce the following expression to indicated number of literals: 6

i. $(A' + C)(A' + C')(A + B + C'D)$ to four literals.

ii. $A'B(D' + C'D) + B(A + A'CD)$ to one literal.

(c) Perform the following number conversions: 6

i. $(125.4)_6$ to octal number

ii. $(146.34)_8$ to hexadecimal number

2 (a) i. Obtained the expression for X in Fig. 1: 6

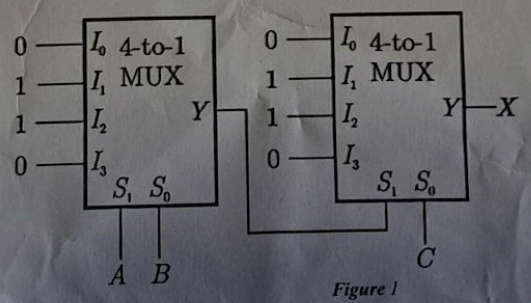

Figure 1

(b) Obtained the expression for F in Fig. 2: 6

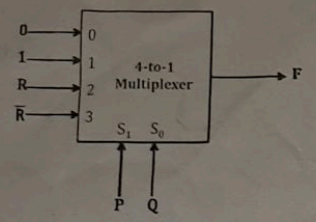

Figure 2

OR

(c) You are presented with a set of requirements under which an insurance policy can be issued. The applicant must be:
i. A married female 25 years old or over, or
ii. A female under 25, or
iii. A married male under 25 who has not been involved in a car accident, or
iv. A married male who has been involved in a car accident, or 12
v. A married male 25 years or over who has not been involved in a car accident.
Find an algebraic expression which assumes a value 1 whenever the policy is issued. Simplify the expression obtained.

3 (a) Note the state Diagram as mentioned in Figure 3 below:
i) Illustrate the State table, Transition Table, k-Maps and Equations.
ii) Design the Digital system using D and T flipflops and other digital gates as required. State all your assumptions. What type of machine is this? 12

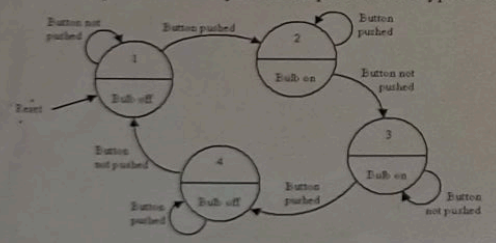

Figure 3: State diagram.

OR

(b) Illustrate the advantages of state reduction and determine the reduced state diagram for the state diagram as shown in Fig. 3. 12

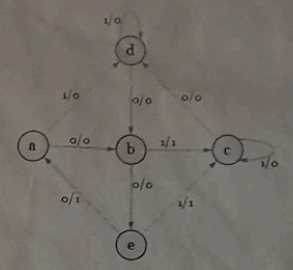

Figure 4: State Diagram.

4 (a) Design a synchronous counter which is capable of counting the multiples of 3; from 3 to 15 using suitable flipflops and gates. 12
Show the required truth tables, transition tables, k-maps and logic diagrams.

OR

(b) Design a Sequence Detector non overlapping type which can detect the sequence of "10010".
i) Show the state diagram and state table.
ii) Design the circuit using D flipflops. 12
iii) Design the circuit using T flipflops.

5 (a) i. Explain the types of programming modellings available in Verilog.
ii. Using structural and behavioral modeling with procedural coding, write down the Verilog HDL code for the following circuit: 12

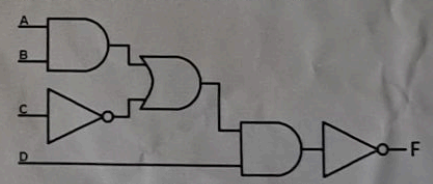

Figure 5: Combinational Circuit.

OR

(b) Using both structural and behavioural modelling, write down the Verilog HDL code for the following digital logic circuit:
i. 3:8 decoder using 2:4 decoders. 12
ii. 4:1 Mux.

PART B – (40 Marks)

6 Demorganize the following expressions:

a. $(xy' + x'y)'$
b. $[(a + c)(a + b')(a' + b + c')]'$ 8
c. $[z + z'(v'w + xy)]'$

7 Simplify the following Boolean function F, together with the don't-care conditions d, and then express the simplified function in sum of maxterms: 8

i. $F(A,B,C,D) = \sum(0,6,8,13,14)$, $d(A,B,C,D) = \sum(2,4,10)$

ii. $F(A,B,C,D) = \sum(1,3,5,7,9,15)$, $d(x,y,z) = \sum(4,6,12,13)$

8 In a JK flip flop, we have J=Q' and K = 1. Assume the flip flop was initially cleared and then clocked for 6 pulses, derive the sequence of output Q. Also draw the block diagram of the above circuit. 8

9 A decoding system receives the following input sequence "010110" from an FSM system with the following state table starting from its Reset state with "b" as external input as shown in State Table 1.

i) Identify the output sequence

ii) Design the system using T flipflops and logic gates as required.

iii) What type of FSM is this. 8

PRESENT STATE	NEXT STATE	
	b=0	b=1
W(Reset)	Z,1	X,0
X	W,1	Y,0
Y	Z,0	Z,1
Z	Z,0	Y,1

State Table 1

10 **Write down the Verilog HDL code using behavioural modelling for Full adder (FA) using two Half Adders (HA) circuit.** 8

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MID TERM EXAMINATIONS – April 2024

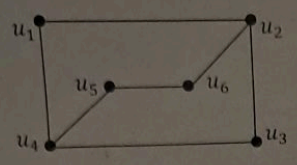
Programme	:	**B.Tech.**	Semester	:	**Winter 2023-24**
Course Title/ Course Code	:	**Discrete Mathematics And Graph Theory/ MAT2002**	Slot	:	**D11+D12+D13**
Time	:	**1 ½ hours**	Max. Marks	:	**50**

Answer all the Questions

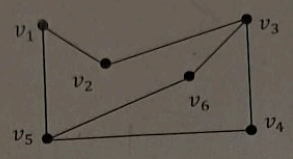
Q.No.	Sub. Sec.	Question Description	Marks
1	(a)	Consider the set $\mathbf{Z}$ of integers. Define $R = \{(a,b): b = a^r \text{ for some positive integer } r\}$, Check that R is a partial order relation on $\mathbf{Z}$.	5
	(b)	Let $f: \mathbf{Z} \to \mathbf{Z}$ be defined by $f(x) = \begin{cases} x, & \text{if } x \text{ is even} \\ 2x-1, & \text{if } x \text{ is odd} \end{cases}$ Determine whether the function f is onto. Find a left inverse of f.	5
2	(a)	Draw the Hasse diagram representing the partial ordering $\{(a,b) \mid a \text{ divides } b\}$ on $\{1, 2, 4, 8, 16\}$.	5
	(b)	Construct switching circuits that produce the following output $x\,(\bar{y}\,z)$. Also, write in complete sum-of-products form (CNF).	5
3	(a)	**(i).** Find the truth tables for $(p \to q) \leftrightarrow (\neg p \vee q)$. **(ii).** Verify that the proposition $\neg((p \wedge q) \wedge \neg(p \vee q))$ is a Tautology.	5
	(b)	Determine the truth value and negation of the following statements: **(i).** $\exists x\, \forall y,\ x^2 - 1 < y$ **(ii).** $\forall x\, \exists y,\ x^2 + y^2 < 14$ **(iii).** $\forall x\, \forall y,\ x^2 + y^2 < 14$ where $U = \{1, 2, 3\}$ is the universal set.	5
4		Use rules of inference to show that the hypotheses "Mohan works hard," "If Mohan works hard, then he is a dull boy," and "If Mohan is a dull boy, then he will not get the job" imply the conclusion "Mohan will not get the job.	10

5 **(a)** Define complete graph and draw the structures of K_5 and K_6. **4**

(b) Determine whether the graphs G1 and G2 are isomorphic. **6**



Graph G1



Graph G2

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MID TERM EXAMINATIONS – March 2024

Programme	:	B.Tech.	Semester	:	Winter 2023-24
Course Title / Course Code	:	Engineering Design and Modelling / MEE2014	Slot	:	A11+A12+A13
Time	:	1 ½ hours	Max. Marks	:	50

Answer all the Questions

Q.No.	Sub. Sec.	Question Description	Marks
1		Demonstrate the Dieter Ram's principles of good design and analyse each of the principles for the design of a wardrobe. Draw a sketch as well.	10
2		Why does aesthetic design matter? How does aesthetic design differ from functional design? Illustrate an example, where the designer has to compromise between "Aesthetic and Functionality".	10
3		Redesign an office chair adopting the concept of SCAMPER. Draw rough sketch at each step.	10
4		How can you handle the amount of risk involved in a project?	10
5		A group of students from the 2022 batch thinking to design a new VTOP portal for VIT Bhopal. Students have developed the website as well and now they are thinking to conduct usability testing for the website. Investigate the complete steps in detail.	10

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Aim of the program
Algorithms steps:
flowchart.
c++ program
Sample input output.

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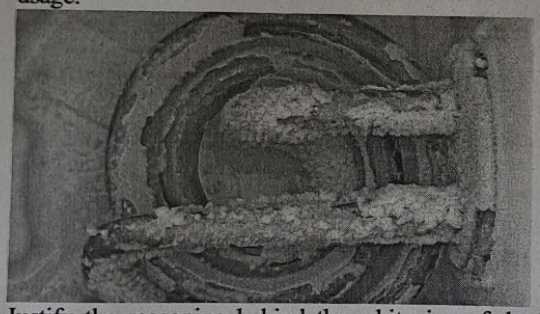
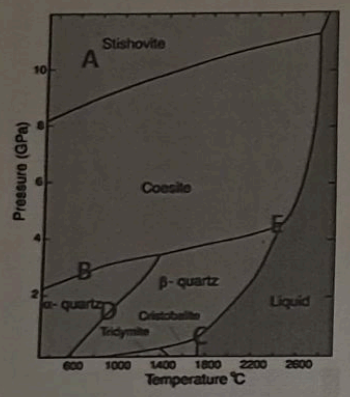
TERM END EXAMINATIONS (TEE) – October - November 2023

Programme	:	**B.Tech.**	**Semester**	:	**Fall 2023-24**
Course Title/ Course Code	:	**Engineering Chemistry/ CHY1001**	**Slot**	:	**E11+E12+E13+E14**
Time	:	**3 Hrs.**	**Max. Marks**	:	**100**

Answer ALL the Questions

Q. No.		Question Description	Marks
		PART A – (60 Marks)	
1	(a)	Using complexometric titrations, Gurleen found that the water sample from VIT Bhopal has a very high degree of hardness. Explain the process (construction, working, and regeneration) of water softening that she can use with the help of hydrated sodium aluminosilicate minerals.	10
		OR	
	(b)	The electric kettle used by Paarth in his home looks like this after some months of usage.  Justify the reasoning behind the whitening of the heating filament. Illustrate if such a formation will cause any issues with the functioning of the electric kettle. Identify some ways to reduce and remove such a formation.	10
2	(a)	Draw the phase diagram of water and describe the effects produced by isothermal increase and decrease of pressure on the following systems of water. (i) A system on the sublimation curve. (ii) A system at the triple point. (iii) A system below the sublimation and vaporization curve.	10
		OR	

(b) Jahnvi, Sudipa, Manul, Ananya, and Harsh examined the SiO_2 phase diagram using the provided illustration, and each of them pointed out a single state point: A, B, C, D, and E. You have to help them identify the phases and calculate the degrees of freedom at each of these state points. 10



3 (a) An arbitrary zero potential is assigned to which electrode? With the help of a diagram and all the reactions involved, explain how you can determine the value of the electrode potential of zinc relative to this electrode. 10

OR

(b) (i) Small anodic area results in intense corrosion. Justify the statement. 3+4+3

(ii) Zinc gives better protection to iron than tin under a corrosive environment. Why?

(ii) Iron corrodes faster than aluminum, even though aluminum has a more negative standard reduction potential value compared to iron. Why?

4 (a) A fuel cell operates with continuous replenishment of fuel at electrodes and doesn't require charging. Justify the above sentence by explaining the construction and working of the H_2-O_2 fuel cell. 10

OR

(b) Secondary lithium-ion batteries are batteries that function based on the transfer of lithium ions between a cathode and an anode. Elucidate the above sentence with the construction and working of the secondary lithium-ion battery. 10

5 (a) During the determination of the calorific value of a coal sample by the Bomb's calorimeter following results were recorded : 10

Weight of fuel burnt = 1.9 gm
Water equivalent of calorimeter = 0.5 Kg
Weight of water taken in calorimeter = 2.300 Kg
Initial temp. of water = 25.05 °C
Final temp. of water = 29.23 °C
Acid correction = 15 cal

Fuse wire correction = 7 cal
Thread correction = 5 cal
Cooling correction = 0.26 °C
If the fuel contains 7.5% hydrogen, calculate the Gross and net calorific value of the coal sample provided that the latent heat of steam condensed is 587 cal/g.

OR

(b) (i) 1.96 g of the coal was Kjeldahlized, and NH_3 gas thus evolved could neutralize 50 mL of 0.2 N HCl. Calculate the N% in the sample. 5+5

(ii) 4.50 g of the coal sample in a quantitative analysis gave 0.1855 g of $BaSO_4$. Calculate the S% in the sample.

6 (a) Discuss the preparation, properties, and uses of the polymer made from the monomers ethylene glycol and terephthalic acid. How can you justify that the resulting polymer is a copolymer and a condensation polymer? 10

OR

(b) Ank and Pragati, after attending the engineering chemistry class, try to understand how many different polymers have been used in making different parts of their car. They notice that the dashboard and wheel cover of their car are made of ABS polymer while the doors of the car are made of PVC. The engine was made of Nylon 66, a thermoplastic to withstand harsh temperatures. Identify the monomers of all the polymers mentioned in the above statements and discuss their method and type of polymerization. 10

PART B – (40 Marks)

7 A water sample is alkaline to phenolphthalein as well as methyl orange. 40 ml of the water sample on titration with N/20 HCl required 8.8 ml of the acid to the phenolphthalein end-point. When a few drops of methyl orange were added to the same solution, and the titration further continued, the yellow color of the solution just turned red after the addition of another 13.5 ml of the acid solution. Elucidate on the type and extent of the alkalinity present in the water sample. Express the alkalinities also in °Fr and °Cl units. 10

8 From the data: 10

$Cr^{3+} + 3e^- = Cr \qquad E^0_{Cr^{3+}|Cr} = -0.74\ V$

$Cr^{3+} + e^- = Cr^{2+} \qquad E^0_{Cr^{3+},Cr^{2+}|Pt} = -0.40\ V$

Compute E^0 of the reaction: $Cr^{2+} + 2e^- = Cr$.
Use $\Delta G^0 = -nFE^0_{cell}$

9 A sample of coal was found to have the following % composition C = 75%, H = 8%, O = 6.1%, N = 4.2%, S = 4.2% & ash = 2.5%. Calculate the minimum amount of air necessary for complete combustion of 4 kg of coal. Also, calculate the HCV & LCV of the coal sample. 10

10 Phenol and formaldehyde undergo condensation to give a polymer (A) which on heating with formaldehyde gives a thermosetting polymer (B). Name the polymers. Write the reactions involved in the formation of (A) and (B). What is the structural difference between the two polymers? Also, mention the properties and applications of polymer (B). 10

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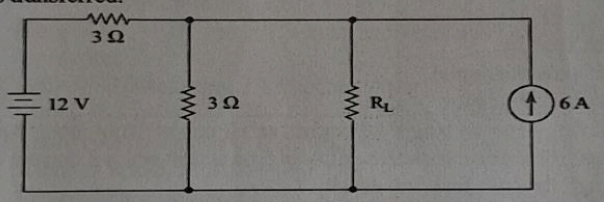
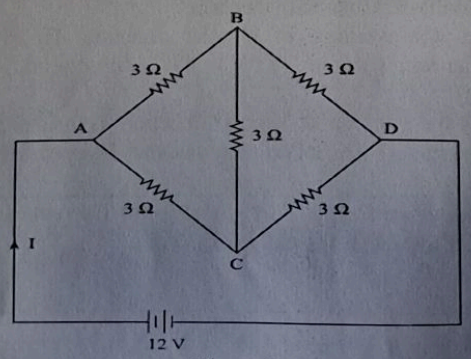
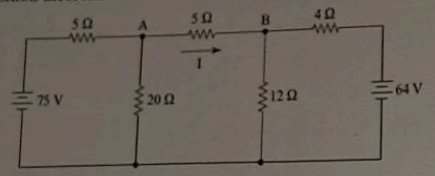
TERM END EXAMINATIONS (TEE) – October - November 2023

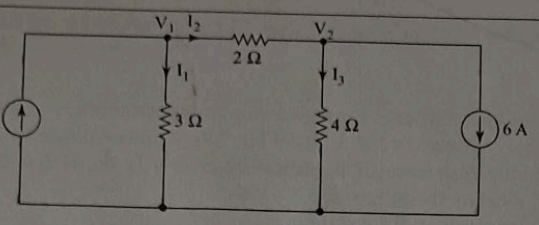
Programme	:	**B.Tech.**	**Semester**	:	**Fall 2023-24/Trimester I/IV 2023-24**
Course Title	:	**Electric Circuits and Systems/EEE1001**	**Slot**	:	**C11+C12+C13+C14**
Time	:	**3 Hrs.**	**Max. Marks**	:	**100**

Answer ALL the Questions

Q. No.		Question Description	Marks
		PART A – (60 Marks)	
1	(a)	Explain Maximum Power Transfer Theorem with an example.	4
	(b)	Find the Figure 1 below. Calculate the value of load resistance, R_L for which maximum power will flow to the load. Also calculate the maximum power transfer efficiency, i.e., the power transmission efficiency when maximum power is transferred.  Figure 1	8
		OR	
	(c)	i) Calculate the current, I supplied by the battery in the circuit shown in Figure 2:  Figure 2	4

		ii) For the circuit shown in Figure 3, calculate the current, I using the superposition theorem.  Figure 3	8
2	(a)	With respect to parallel RLC circuit answer the following questions: i) Draw a parallel RLC circuit and the corresponding Phasor diagram and explain clearly. ii) Derive the total impedance of the circuit.	6
	(b)	A 1kΩ resistor, a 142mH coil and a 160uF capacitor are all connected in parallel across a 240V, 60Hz supply. Calculate the impedance of the parallel RLC circuit and the current drawn from the supply.	6
		OR	
	(c)	i) Explain the following terms: a) Permeability, b) Magneto Motive Force, c) Magnetic Field Strength, d) Flux Density, e) Self-Inductance and f) Mutual Inductance.	6
		ii) An iron ring of mean length 50 cm has an air gap of 1mm and a winding of 200 turns. If the relative permeability of iron is 300 when a current of 1A flows through the coil, find flux density.	6
3	(a)	With respect to NPN Bipolar Junction Transistor, answer the following questions: i) Discuss the working of NPN Bipolar Junction Transistor in Common Base Mode with diagram. ii) Discuss the working of Bipolar Junction Transistor as an amplifier with diagram. (NPN or PNP, any one may be used to explain) iii) Discuss the working of Bipolar Junction Transistor as a switch with diagram. (NPN or PNP, any one may be used to explain)	9
	(b)	In a BJT, the emitter current is 8 mA and Base Current, $I_B = I_C/100$. Determine I_C and I_B where I_C is the collector Current.	3
		OR	

	(c)	i) Discuss the working of Half Wave rectifier with diagram and graphs as required.	4
		ii) The input to a bridge rectifier is through a step-down transformer of turn ratio 10:1. The supply voltage is 230 V at 50 Hz. The load resistance is 1.2 kΩ secondary winding resistance of the transformer is 4 Ω diode forward resistance is 2 Ω. Calculate the following: a) DC Power output of the rectifier b) AC power input c) Efficiency of the bridge rectifier.	8
4	(a)	The alarm system of the car is ON, when any one or more of the following events is true: Any door of the car is open, speed is high beyond a certain level, fuel is low. Consider each of these events stated in its form as logic "1" and the opposite as logic "0". i) Write the truth table ii) Find the minimized Boolean equation for this system. Show all steps. iii) Draw the logic diagram for this digital system. State all your assumptions if any.	7
	(b)	Design a Full Adder circuit using Half Adder and logic gates as required. Show diagrams, truth table, equations for explanation as required.	5
		OR	
	(c)	Design the following Multiplexers: i) Design 8:1 MUX using 4:1 mux and other low order MUX or logic gates. ii) Design 4:1 Mux using 2:1 Mux and other logic gates as required.	12
5	(a)	With respect to Stepper motor answer the following questions: i) Working Principle of Stepper motor ii) Types of Stepper motor iii) Applications of Stepper motor	12
		OR	
	(b)	Answer any two questions: i) Discuss Working Principle of Servo motor and state its applications ii) Design XNOR gate using NOR gates only iii) Design SR flip flop and D flip flop. Give proper explanation and write the truth table and draw logic diagram as required.	12
		PART B – (40 Marks)	
6		Using nodal analysis calculate the current flowing through all the branches in the network shown in Figure 4.	8

		 Figure 4	
7		A series RLC circuit containing a resistance of 12Ω, an inductance of 0.15H and a capacitor of 100uF are connected in series across a 100V, 50Hz supply. Calculate the total circuit impedance, the circuit's current, power factor and draw the voltage phasor diagram.	8
8		With respect to PN junction diode, explain what happens with diagrams: (Also state the modes of operation for each case). i) If the P-terminal of the diode is connected at higher voltage with respect to N-terminal. ii) If the P-terminal is connected to lower voltage with respect to N-terminal.	8
9		Prove the following using Boolean Algebra: i) ABC +ABC' + AB'C + A'BC = AB+AC+BC ii) ABC +A' + AB'C = A' + C	8
10		With neat diagram explain main parts of DC machine. Mention functions of each part.	8

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Mid-Term Examinations, September 2023

Programme	:	B. Tech, Int. M.Tech	Semester	:	Fall 2023-2024
Course	:	Data Structures and Algorithms / CSE2002	Slot/Class No.	:	A11+A12+A13+A14
Time	:	1½ hours	Max. Marks	:	50

Answer all the Questions

Q. No.	Question Description	Marks
1	(a) What are asymptotic notations? Discuss its types.	5
	(b) Exemplify the concept of abstract data type.	5
2	Design an algorithm to calculate the sum of all elements in an array of integers. Explain the steps of your algorithm and analyze its time complexity.	10
3	Given an array of integers, find the two numbers that result in the maximum product when multiplied together. Use selection sort to find these two numbers efficiently.	10
4	Write a recursive function that uses the ***divide-and-conquer*** approach to arrange the number in order. Derive and explain the recurrence relation that determines the time complexity of the recursive relationship.	10
5	(a) Imagine you are developing an **online shopping cart** for an e-commerce website. Customers can **add** or **remove** items from their cart, and the order of items added should be preserved. Additionally, you need to efficiently allow customers to easily **traverse** their cart, as well as perform **addition and deletion of items**. Which data structure would you choose to implement the shopping cart, and why?	4
	(b) Implement the suitable data structure and demonstrate the **traversal, addition, and deletion** operations.	6

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MID TERM EXAMINATIONS – December 2023

Programme	:	**B.Tech.**	Semester	:	**Interim 2023-24**
Course Title/ Course Code	:	**Python Programming/ CSE3011**	Slot	:	**A11+D11+A12+D12+A13**
Time	:	**1 ½ hours**	Max. Marks	:	**50**

Answer all the Questions

Q.No.	Sub. Sec.	Question Description	Marks
1		How many types of operators are supported by the Python language? Evaluate the expression, (X + Y – abs(X – Y))//2, when (i)X = 4 and Y = 6 (ii)X = 5 and Y = 4 Show each step and tell the output.	10
2		An ATM contains Indian currency notes of 100, 500 and 1000. To withdraw cash from this ATM, the user has to enter the number of notes he/she wants of each currency, i.e. of 100, 500 and 1000. Write a program to calculate the total amount withdrawn by the person from the ATM in rupees. Include flowchart and algorithm in your answer.	10
3		Differentiate list, sets, tuples and dictionaries with suitable example. Write a Python program that executes a list operation and handles an AttributeError exception if the attribute does not exist.	10
4		Illustrate the usage of following functions with the help of example. 1. range() 2. round() 3. print() 4. split() 5. format()	10
5		Explain the necessity and importance of object oriented features in programming. Write a program to demonstrate the use of self with an instance variable to solve the problem of variable hiding.	10

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TERM END EXAMINATIONS (TEE) – January 2024

Programme	:	B.Tech.	Semester	:	Interim 2023-24
Course Name/ Course Code	:	Sensors and IoT/ ECE4006	Slot	:	C11+F11+C12+F12+C13
Time	:	3 Hrs.	Max. Marks	:	100

Answer ALL the Questions

Q. No.		Question Description	Marks
		PART A – (60 Marks)	
1	(a)	Illustrate the function of IoT architecture with a real time application with a neat sketch.	12
		OR	
	(b)	Explain about the actuators and its types. What is the difference between sensors and actuators.	12
2	(a)	Elaborate the fundamental characteristics of a sensor. Also explain how the characteristics of these sensors are tailored to meet the specific needs of each application?	12
		OR	
	(b)	Which sensor is used to monitor the environment by capturing images and store the image frames. Identify the sensor and explain its working in detail.	12
3	(a)	Explain about the electrodes used in ECG.	12
		OR	
	(b)	Illustrate the working of GPS with a neat sketch.	12
4	(a)	Explain about the interfacing of biomedical sensors.	12
		OR	
	(b)	Explain about the ARM programmer's model.	12
5	(a)	Illustrate about the COAP protocol. Also explain different message types of COAP?	12
		OR	
	(b)	Explain about the MQTT protocol. Also list the messages used in MQTT?	12
		PART B – (40 Marks)	
6		Briefly illustrate the overview of IoT.	8
7		Elaborate how the piezoelectric effect is used as a sensing element in sensors.	8
8		Explain in brief about the types of sensors used in automobile to measure the flow.	8
9		Illustrate how the serial communication will be interfaced with ARM microcontroller in detail.	8

10 Elaborate about the HTTP protocol. Also explain how it is used with sensor interfacing. 8

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MID TERM EXAMINATIONS – September 2023

Programme	:	B.Tech.	Semester	:	Fall 2023-24
Course Title/ Course Code	:	Electric Circuits and Systems/ EEE1001	Slot	:	C11+C12+C13+C14
Time	:	1 ½ hours	Max. Marks	:	50

Answer all the Questions

Q.No.	Sub. Sec.	Question Description	Marks
1	(a)	By applying Thevenin's/Norton's theorem calculate the current flowing through the 16 Ω resistance shown in Fig.1	7

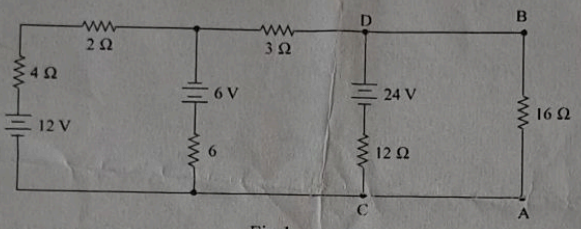

Fig.1

	(b)	With the help of Star-Delta transformation technique, obtain the equivalent resistance at the terminals a-b (Fig.2)	3

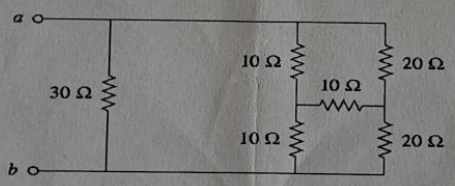

Fig.2

	(a)	Applying KCL, determine the current I_S in the electric circuit to make V_0 = 16 V in the network shown in Fig.3.	7

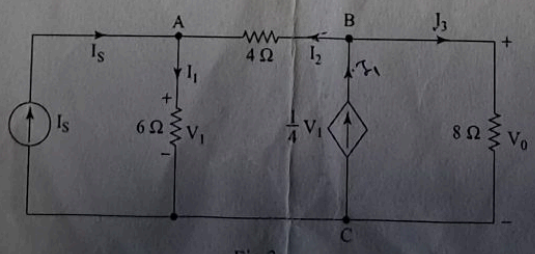

Fig.3

(b) Determine v_0 of the Fig.4

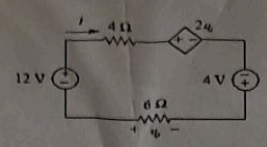

Fig.4 **3**

3 Refer to the circuit shown in Fig. 5. Calculate
(i) $i(0^+)$, $v(0^+)$ (ii) $di(0^+)/dt$, $dv(0^+)/dt$
(iii) $i(\infty)$, $v(\infty)$. (at t=0, the switch will be open)

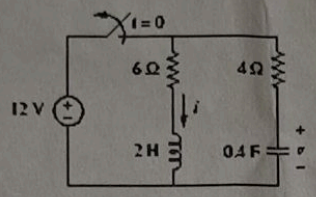

Fig.5 **10**

4 Derive the conditions for overdamped, critically damped and underdamped response for a source free parallel RLC circuit. **10**

5 (a) Identify the electrical equivalents of the following magnetic circuit parameters:
(i) Magnetic flux,
(ii) Magnetomotive force (MMF), and
(iii) Reluctance. **4**

Additionally, establish the mathematical relationship among these electrical equivalents

(b) A circular iron ring of mean diameter 25 cm and cross-sectional area 16 cm^2 is wound with a coil of 100 turns and carries a current of 2.5 A. The relative permeability of iron is 1000. Calculate the amount of flux produced in the ring. **6**

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TERM END EXAMINATIONS (TEE) – January 2024

Programme	:	**B.Tech.**	**Semester**	:	**Interim 2023-24**
Course Name	:	**Python Programming/CSE3011**	**Slot**	:	**A11+D11+A12+A13+D12**
Time	:	**3 Hrs.**	**Max. Marks**	:	**100**

Answer ALL the Questions. Augment each line of your code with comment.

Q. No.		Question Description	Marks
		PART A – (60 Marks)	
1	(a)	Develop a python code for an automated vending machine for the following situation: **Inputs:** item's price and the amount they have. **Conditions and Outputs:** Whether amount entered is sufficient. If sufficient, dispense the item, calculate and provide the change. If insufficient, inform the user and ask them to enter money. Include loops for user interaction and incorporate flowchart and algorithm in your answer.	12
		OR	
	(b)	Display the following patterns using nested loops.	12

Pattern I	Pattern II
1	123456
23	12345
123	1234
1234	123
12345	12
123456	1

2	(a)	Write Python program to sort words in a sentence in decreasing order of their length. Display the sorted words along with their length.	12
		OR	
	(b)	Write a Python program to create and display all combinations of letters, selecting each letter from a different key in a dictionary. Sample data : {'1':['a','b'], '2':['c','d']} Expected Output: ac ad bc bd.	12

3 (a) Write simple programs to illustrate Abstraction, Data Hiding, Variable hiding, Data Encapsulation using self and special methods in Python. 12

OR

(b) You have just started a sales job in a department store. Your pay consists of a base salary plus a commission. The base salary is Rs. 50,000. The following scheme shows how to determine the commission rate: 12

Sales Amount	Commission Rate
Rs. 0.01- Rs.5,000	8 percent
Rs.5,001- Rs.10,000	10 percent
Rs.10,001 and above	12 percent

Your goal is to earn Rs 50,000 commission a year. Write an Object oriented program that finds out the minimum amount of sales you have to generate in order to make Rs 50,000.

4 (a) Demonstrate the role of file operations in Python and Develop a program to copy odd lines of one file to another file. 12

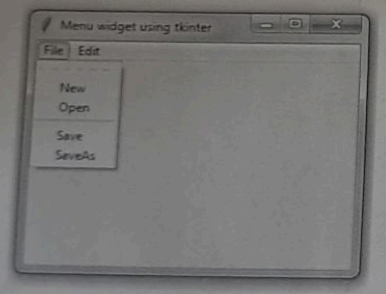
OR

(b) Demonstrate how to insert new records into a MySQL table using Python. Explain the process of updating existing records in a MySQL table. 12

5 (a) What is socket? Elaborate the client-server communication in python. 12

OR

(b) Write a python program to display 12



PART B – (40 Marks)

6 Illustrate the real time application of strings in python? Write a program to implement any two string operations without using built-in functions. 8

7 Suppose you want to deposit a certain amount of money into savings account with a fixed annual interest rate. What amount do you need to deposit in order to have INR 5000 in the account after 3 years? The initial deposit amount can be obtained using the following formula: 8

$$intialDepositAmount = \frac{finalAccountValue}{(1 + monthlyInterestRate)^{numberofMonths}}$$

Write a program that prompts the user to enter final account value, annual interest rate in percent, and the number of years, and displays the initial deposit amount.

8 What do you understand by inheritance? Explain different types of inheritance. Write a program to implement the concept of single inheritance where: 8

i. Create the parent class **Circle**. Initialise the constructor with the radius of the circle.
ii. Define the method **get_radius()** and **calc_area()** to know the radius and area of the circle.
iii. Create the child class named **Cylinder**. Initialise the value of the height within the constructor and call the constructor of the parent class to initialise the radius of the cylinder.
iv. Finally, define the method **Calc_area()** in the class **Cylinder** to calculate the area of the cylinder.

(Note: area of cylinder = 2 * pi * radius * height)

9 Write a Python program to do the following: 8

a. To cause the script to exit back to either the Python console or the command prompt
b. To return the largest integer a variable can take
c. To search path for all Python modules.
d. To display a string containing the version number of the current Python interpreter.

10 Write a program that performs matrix multiplication using multiple threads. Divide the matrix multiplication task among different threads to take advantage of parallel processing. 8

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21-feb C12 11:40 13:10
20feb D11 8:30-10:00
19feb E13 14:50-16:20
20feb D23 2:50-4:20

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TERM END EXAMINATIONS (TEE) – May 2024

Programme	:	B.Tech.	Semester	:	Winter Semester 2023-2024
Course Title/ Course Code	:	Engineering Design and Modeling /MEE2014	Slot	:	A11+A12+A13
Time	:	3 Hrs.	Max. Marks	:	100

Answer ALL the Questions

Q. No.		Question Description	Marks
		PART A – (60 Marks)	
1	a	Outline the term Empathy map and draw it for purchasing a new VR device.	12
		OR	
	b	Apply 'Human Centered Design' framework to analyze the development of smartphone.	12
2	a	Differentiate between modular and integral design. Also enumerate the different types of modular design with neat sketches.	12
		OR	
	b	A user wants to design a new product and currently at its parametric design stage. Write down the seven steps of formulating the parametric design steps.	12
3	a	What do you understand with the term "Social innovation"? Investigate the various drivers with four examples.	12
		OR	
	b	'Sustainable development is the development that meets the needs of the present without compromising the ability of future generations to meet their own needs' - Gro Harlem Brundtland Clarify the above statement with respect to sustainable design and its seven principles.	12
4	a	Write down the sequence of rapid prototyping for the product shown in Figure 1.	12

Figure 1

OR

b Prepare a k-script for registering yourself a seat in online fitness class. 12

5 a Consider rubber band as a material and explain the stress strain diagram for the same. 12

OR

b Differentiate the following: 12
i. Lateral strain and longitudinal strain
ii. Ductile and brittle materials
iii. Young's modulus and Modulus of rigidity

PART B – (40 Marks)

6 Investigate the four C's of the design with suitable examples. 8

7 Enumerate the guidelines to be followed for Design for Production? 8

8 How do you perform Life Cycle Assessment (LCA) of a paper bag? 8

9 'It is essential that storytelling begins early in the life of a project and be woven into every aspect of the innovation effort. It has been common practice for design teams to bring writers in at the end to document a project once it has been completed. Increasingly they are building them into the design team from day one to help move the story along in real time.' by Tim Brown, Change by Design 8

Apply the six rules of storytelling for designing a battery.

10 Explain the five mechanical properties of your choice important for designing a product. 8

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MID TERM EXAMINATIONS – July 2024

Programme	:	B.Tech.	Semester	:	Fall Semester 2024-2025
Course Title	:	Machine Learning	Course Code	:	CSE4005
Date/Session	:	16 July 2024/ Session II	Slot	:	A11+A12+D11+D12
Time	:	1 ½ hours	Max. Marks	:	50

Answer all the Questions

Q.No.	Sub. Sec.	Question Description	Marks
1		How do different classification algorithms, such as multiple linear regression, decision trees, and support vector machines, compare in terms of their input requirements, output predictions, and suitability for various types of data?	10
2	(a)	List the fundamental differences between supervised and unsupervised learning algorithms with examples.	5
	(b)	Explain the concept of version space. Differentiate the S-set and G-set with an example.	5
3		Write a code snippet to implement linear regression for predicting house prices. Utilize appropriate libraries and include a 70-30 train-test split.	10
4		What is a decision tree, how it is constructed in the context of machine learning, and what are the various terminologies associated with it?	10
5		Write a Python program that implements the k-means clustering algorithm with k=2 using available libraries and modules.	10

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MID TERM EXAMINATIONS – July 2024

Programme	:	**B.Tech.**	Semester	:	**Fall Semester 2024-25**
Course Title	:	**Programming in Java**	Course Code	:	**CSE2006**
Date/Session	:	**18 July 2024/ Session I**	Slot	:	**C12+C13+F12+F13**
Time	:	**1 ½ hours**	Max. Marks	:	**50**

Answer all the Questions

Q.No.	Sub. Sec.	Question Description	Marks
1		Summarize the Java JVM, JRE and JDK with suitable example.	10
2	(a)	Write a Java program using Flow control statements to get the value at run time .Given the number Fibonacci Series.	5
	(b)	Explain any five Java Operators with suitable example.	5
3		Write a Java program to create an interface Playable with a method play() that takes no arguments and returns void. Create three classes Football, Volleyball, and Basketball that implement the Playable interface and override the play() method to play the respective sports.	10
4		Write a Java program to create a base class Animal with methods move() and makeSound(). Create two subclasses Bird and Panthera. Override the move() method in each subclass to describe how each animal moves. Also, override the makeSound() method in each subclass to make a specific sound for each animal with using super keyword in instance variable, method and Constructor .	10
5		Write a Java program that throw and throws an exception and catch it using a try-catch block.	10

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TERM END EXAMINATIONS (TEE) – August 2024

Programme	:	B.Tech.	Semester	:	Fall Semester 2024-2025
Course Name	:	Machine Learning	Course Code	:	CSE4005
Date / Session	:	20 Aug 2024 / Session-I	Slot	:	A11+A12+D11+D12
Time	:	3 Hrs.	Max. Marks	:	100

Answer ALL the Questions

Q. No.		Question Description	Marks
		PART A – (60 Marks)	
1	(a)	Analyse the process of Find-S algorithm. How does the algorithm refine hypotheses through its iterative steps, and how does it ensure that the final hypothesis is the most specific one consistent with the positive training examples?	12
		OR	
	(b)	Compare and contrast the characteristics of version space, finite hypothesis space, and infinite hypothesis space. How does the size and nature of the hypothesis space impact the learning process?	12
2	(a)	Using the Radial Basis Function (RBF) as an activation function, write a Python code snippet to classify a given dataset with SVM.	12
		OR	
	(b)	Analyze how Gini impurity is used to determine the best split in decision trees? Illustrate.	12
3	(a)	Demonstrate the systematic procedure of Bagging by detailing each step involved. Include an example of how Bagging can be applied to a specific machine learning algorithm to improve its performance.	12
		OR	
	(b)	Given the following dataset and initial centroids (Centroid1: (2, 3) and Centroid2: (6, 5)), apply the *K*-Means clustering algorithm to this dataset.	12

ID	x1	x2
1	2	3
2	3	3
3	6	5
4	8	8

4 (a) Explain how the Naïve Bayes Classifier processes the data to make predictions using python. 12

OR

(b) Find the frequent item sets using FP Growth algorithm where minimum support count is 3. 12

T1: A, B, C
T2: A, B, D
T3:A, C, D
T4: B, C, D
T5: A, B, C, D
Also evaluate the interesting rules.

5 (a) Given a binary disease classification model, which predict whether a patient has a certain disease. Calculate Accuracy, Precision, recall and f-measure when **TP:** 50, **FP:** 5,**TN:** 35 and **FN:** 10 for the given model. 12

OR

(b) Given a dataset containing columns of class labels and predicted probabilities. How would you generate a Receiver Operating Characteristic (ROC) curve? Calculate and interpret the Area Under the Curve (AUC). 12

Instance	True Label (y)	Predicted Score (p)
1	0	0.2
3	0	0.4
8	1	0.85
5	0	0.3
2	1	0.55
10	1	0.75
4	1	0.7
6	1	0.65
9	0	0.5
7	0	0.1

PART B – (40 Marks)

6 Find the version space for the following dataset using candidate elimination algorithm with clear steps. 8

Size	color	Shape	Class
Big	Red	Circle	No
Small	Red	Triangle	No
Small	Red	Circle	Yes
Big	Blue	Circle	No
Small	Blue	Circle	Yes

7 Consider a dataset containing information about various plants, including their height, width, and type (e.g., flower, shrub, tree), use the K-Nearest Neighbors (KNN) algorithm to classify a new plant based on its height and width. 8

8 Perform hierarchical clustering using complete linkage. Also, write the code to visualize the clustering for the following dataset. 8

Point	x_1	x_2
A	1	2
B	2	3
C	6	5
D	8	8

9 In the context of association rule mining demonstrate how do the concepts of support, confidence, and lift contribute to evaluating the effectiveness with an example. 8

10 Find a new instance using SMOTE to balance a dataset where the minority class is underrepresented. Consider an instance and one of its nearest neighbors from the minority class. Given: x_1=[1.5, 2.5], $x_{neighbour}$= [3.0, 6.0] 8

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TERM END EXAMINATIONS (TEE) – August 2024

Programme	: B.Tech.	Semester	:	Fall Semester 2024-25
Course Title	: Programming in Java	Course Code	:	CSE2006
Date/Session	: 29 Aug 2024/Session-I	Slot	:	C12+F12+C13+F13
Time	: 3 Hrs.	Max. Marks	:	100

Answer ALL the Questions

Q. No.		Question Description	Marks
		PART A – (60 Marks)	
1	(a)	Summarize the Java JVM, JRE and JDK with suitable example.	12
		OR	
	(b)	Write a Java program to generate the prime numbers between 1 to 100 and print which is divisible 11.	12
2	(a)	Write a Java program to create an abstract class Animal with abstract methods are eat() and sleep(). Create subclasses Lion, Tiger, and Deer that extend the Animal class and implement the eat() and sleep() methods differently based on their specific behavior..	12
		OR	
	(b)	Write a Java programming to create a banking system with three classes – Bank Account, SavingsAccount, and CurrentAccount. The bank should have a list of accounts and methods for adding them. Accounts should be an interface with methods to deposit, withdraw, calculate interest, and view balances. SavingsAccount and CurrentAccount should implement the Account interface and have their own unique methods.	12
3	(a)	Discuss the Common Scenarios of Java Exceptions with suitable example.	12
		OR	
	(b)	Write a java Program to implement multithreading by extending Thread class method using start(), wait(), stop() ,run(),sleep(),yield() and join().	12
4	(a)	Give two one dimensional array A and B which are sorted in ascending order. Write a java program to marge them into a single sorted array, see that is contains every item from array A and B, in ascending order.	12
		OR	
	(b)	Explain the following collection set interface statement . i. Hashset ii. Linkedset iii. Treeset .	12

5 (a) Explain and details about the JDBC-ODBC bridge . 12

OR

(b) Discuss with neat sketch for JPA Architecture in details. 12

PART B – (40 Marks)

6 Explain the Java Operators with suitable example(Any Five). 8

7 Write a Java program to create a base class Sports with a method called play(). Create three subclasses: Football, Basketball, and Rugby. Override the play() method in each subclass to play a specific statement for each sport and use super() method. 8

8 Explain the Thread Life Cycle model with neat diagram. 8

9 Outline the need for streams with suitable diagram and its types with an example. 8

10 Summarize the need for Object-Relation Mapping (ORM) in details. 8

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TERM END EXAMINATIONS (TEE) – May 2024

Programme	:	**B.Tech.**	**Semester**	:	**Winter Semester 2023-24**
Course Title	:	**Engineering Design and Modelling / MEE 2014**	**Slot**	:	**B21+B22+B23**
Time	:	**3 Hrs.**	**Max. Marks**	:	**100**

Answer ALL the Questions

Q. No.		Question Description	Marks
		PART A – (60 Marks)	
1	a	"Good design is unobtrusive". Explain the above in detail with minimum four suitable examples.	12
		OR	
	b	Elaborate "Design failures and its impact" using four real-time examples.	12
2	a	With an example differentiate design for manufacturing & design for assembly.	12
		OR	
	b	Explain eight points of "Problem formulation" in detail.	12
3	a	With suitable two examples each explain social innovation, Recycling & Life cycle assessment.	12
		OR	
	b	Explain sustainable design principles with three examples.	12
4	a	Differentiate blend and thematic method with minimum three examples.	12
		OR	
	b	What are the process chain steps involved in developing a 3D model using rapid prototyping technique?	12
5	a	List and explain any six mechanical properties.	12
		OR	
	b	Write short notes on: a) Elasticity and Elastic limit b) Hooke's law and Elastic moduli c) Plasticity region	12

PART B – (40 Marks)			
6		Demonstrate the working of seven-steps of project work principle with a proper example.	8
7		Apply modular engineering to a conventional portable table fan and design a cooler which can be used in different territories. Illustrate the design using sketches.	8
8		Explain the term Bio-mimicry and how to relate biomimicry as the design to nature with two examples.	8
9		Write a K-Script for developing a process to maintain the physical and mental health of aged senior citizens.	8
10		Elaborate stress and strain, also stress-strain diagram with proper terminologies.	8

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TERM END EXAMINATIONS (TEE) – January 2024

Programme	:	B.Tech.	Semester	:	Interim 2023-2024
Course Title/ Course Code	:	Applied Numerical Methods/ MAT2003	Slot	:	B21+E21+B22+E22+B23
Time	:	3 Hrs.	Max. Marks	:	100

Answer ALL the Questions

Q. No.		Question Description	Marks
		PART A – (60 Marks)	
1	(a)	Nafisa invested her inheritance of Rs. 20,000 in three different investment options: real estate, stocks, and bonds. The real estate investment offers 6 % annual return, the stocks provide 10 % annual return, and the bonds yield 8 % annual return. She invested twice as much in stocks as in real estate. The total interest earned in one year was Rs. 2,024. How much did she invest in each type of fund? Write the system of linear equations corresponding to the given problem. Is your system solvable by Gauss-Seidel method? If yes, solve it. If not, provide justification and solve the system using the Gauss elimination method.	12
		OR	
	(b)	Consider the temperature control in a greenhouse using three heaters: Heater A, Heater B, and Heater C. The system of linear equations is given by: $$\begin{aligned} 5x - 2y + z &= 12 \\ 2x + 8y - kz &= -18 \\ -x - 3y + 7z &= 24 \end{aligned}$$ (i) What condition on k ensures the system is diagonally dominant? (ii) Explain the significance of the diagonally dominant property in solving the system. (iii) Choose one value of k for which the system is diagonally dominant and use that value to solve the system by Gauss-Seidel method. Do your calculation till four iterations.	12
2	(a)	What are Algebraic and Transnational Equations? Provide brief explanations of any two numerical methods, from your syllabus, used to solve these types of equations. Additionally, elucidate the reasoning behind learning multiple methods.	12
		OR	
	(b)	Find all roots of the equation $\cos x = x^2 + x$ correct to five decimal places.	12
3	(a)	Let $P(x)$ be the interpolating polynomial for the data $(0,0), (0.5, a), (1,3), (2,2)$. Find a if the coefficient of x^3 in $P(x)$ is 6.	7
	(b)	If $f(x) = x^2$, find the divided difference $f[2,0,2,4]$.	5

OR

(c) Obtain the cubic spline fit for the data 12

x	0	1	2	3
$f(x)$	1	4	10	8

under the end conditions $f''(0) = 0 = f''(3)$ and valid in the interval $[1, 2]$. Hence, obtain the estimation of $f(1.5)$.

4 (a) Given $\log_{10} 654 = 2.8156$, $\log_{10} 656 = 2.8169$, $\log_{10} 658 = 2.8182$, $\log_{10} 660 = 2.8195$. Estimate $(655)^{-1}$. 8

(b) If the trapezoidal rule with single interval $[0, 1]$ is used for calculating the integral $\int_0^1 (x^3 - cx^2)\, dx$, then find the value of c. 4

OR

(c) (i) Obtain an approximate value of 12

$$I = \int_{-1}^{1} (1 - x^2)^{\frac{1}{2}} \cos x \, dx$$

using Gauss-Legendre two-point formula.

(ii) Estimate the integral

$$I = \int_{20}^{24} \frac{2x}{1 + x^4} dx$$

using the Gauss-Legendre three-point integration formula and compare it with the exact solution.

5 (a) The fourth order Runge-Kutta method is used to solve the initial value problem 12

$$\frac{dy}{dx} = y, y(0) = \alpha.$$

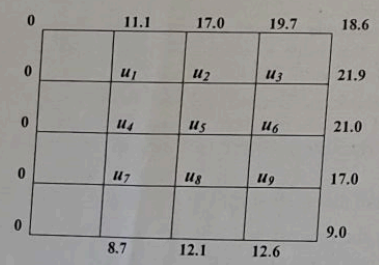
If $y(1) = 1$ is obtained by taking the step-size $h = 1$, then find the value of K_4. Also find $y(2)$.

OR

(b) Solve 12

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$$

at the nine mesh points of the square given below. The values of u at the boundary are specified in the figure.



PART B – (40 Marks)

6 In a circuit with three resistors connected in series, the voltage-drop across each resistor is modelled by the following tridiagonal linear system of equations: 8

$$\begin{aligned} 2V_1 - 3V_2 &= 10 \\ -2V_1 + 7V_2 - 4V_3 &= 5 \\ -3V_2 + 6V_3 &= 8 \end{aligned}$$

Apply the Thomas Algorithm to find the voltage distribution across the resistors.

7 The current i in an electric circuit is given by $i = 10e^{-t} \sin 2\pi t$, where t is in seconds. Apply secant method to find the value of t correct to three decimal places for $i = 2$ amp. 8

8 From the following table, of half-yearly premium for policies maturing at different ages, estimates the premium for policies maturing at age 46. 8

Age x:	45	50	55	60	65
Premium y:	114.84	96.16	83.32	74.48	68.48

9 The velocity of a train which starts from rest is given by the following table, the time being reckoned in minutes from the start and the velocity in km/hour: 8

t	0	2	4	6	8	10	12	14	16	18	20
v	0	16	28.8	40	46.4	51.2	32	17.6	8	3.2	0

Using Simpson's $\frac{1}{3}$ rule, estimate the total distance run in 20 minutes. Determine whether Simpson's $\frac{3}{8}$ rule can be applied for estimating the total distance run in the same time duration. If it is applicable, employ Simpson's $\frac{3}{8}$ rule; If not, provide a justification for your answer.

10 Given the initial value problem 8

$$y' = x^2 + y^2, y(0) = 0$$

determine the first two non-zero terms in the Taylor series for $y(x)$ and hence obtain the value of $y(1)$.

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TERM END EXAMINATIONS (TEE) – August 2024

Programme	:	B.Tech.	Semester	:	Fall Semester 2024-2025
Course Name	:	Database Management Systems	Course Code	:	CSE3001
Date/Session	:	21 Aug 2024/Session I	Slot	:	A14+B14+C14+E14+F14
Time	:	3 Hrs.	Max. Marks	:	100

Answer ALL the Questions

Q. No.	Question Description	Marks

PART A – (60 Marks)

1. (a). Draw an ER diagram that captures the preceding information and identify any constraints not captured by the ER diagram for the following scenario: **12**

The Prescriptions-R-X chain of pharmacies has offered to give you a free lifetime supply of medicine if you design its database. Given the rising cost of health care, you agree. Here's the information that you gather:

Patients are identified by an SSN, and their names, addresses, and ages must be recorded. Doctors are identified by an SSN. For each doctor, the name, specialty, and years of experience must be recorded. Each pharmaceutical company is identified by name and has a phone number. For each drug, the trade name and formula must be recorded. Each drug is sold by a given pharmaceutical company, and the trade name identifies a drug uniquely from among the products of that company. If a pharmaceutical company is deleted, you need not keep track of its products any longer. Each pharmacy has a name, address, and phone number. Every patient has a primary physician. Every doctor has at least one patient. Each pharmacy sells several drugs and has a price for each. A drug could be sold at several pharmacies, and the price could vary from one pharmacy to another. Doctors prescribe drugs for patients. A doctor could prescribe one or more drugs for several patients, and a patient could obtain prescriptions from several doctors. Each prescription has a date and a quantity associated with it. You can assume that, if a doctor prescribes the same drug for the same patient more than once, only the last such prescription needs to be stored. Pharmaceutical companies have long-term contracts with pharmacies.

A pharmaceutical company can contract with several pharmacies, and a pharmacy can contract with several pharmaceutical companies. For each contract, you have to store a start date, an end date, and the text of the contract. Pharmacies appoint a supervisor for each contract. There must always be a supervisor for each contract, but the contract supervisor can change over the lifetime of the contract.

OR

(b). What are the similarities between E-R model and relational model? How the entity, attributes, primary key and relationship are shown in the E-R model and relational model. **12**

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Name : Bodhisat

2. (a). Write **Relational Algebric Expressions** for the following queries. **12**

Employee (Eno, Ename, Salary, Designation, Dno)
Department (Dno, Dname, Mamager_Eno)
Customer (Cno, Eno, Address, City)

1) To find out name of employees who are 'Manager'.
2) To display name of customers.
3) To retrieve employee records whose salary is less than 20,000.
4) To retrieve the name of employee who are Managers and lives in Bhopal.
5) Retrieve the department name and average salary of each department.

OR

(b). Write the algorithm to find the minimal cover for a set of FD's: **12**
Consider R={A, B, C, D, E, F}

$$FD = \begin{cases} A \rightarrow C \\ AC \rightarrow D \\ E \rightarrow AD \\ E \rightarrow F \end{cases}$$

What is the primary key of this relation R? What is its highest normal form? Preserving the dependency, decompose R into third normal form.

3. (a). Consider you are an accountant in an organisation. People are depositing money in various schemes. At the end of day, you want total sum you received. Write a simple SQL Trigger program that will sum up all amount at the time of insertion. **12**

OR

(b). The following relations keep track of airline flight information: **12**

Flights (flno: integer, from: string, to: string, distance: integer, departs: time, arrives: time, price: integer)
Aircraft (aid: integer, aname: string, cruisingrange: integer)
Certified (eid: integer, aid: integer)
Employees (eid: integer, ename: string, salary: integer)

Note that the Employees relation describes pilots and other kinds of employees as well; every pilot is certified for some aircraft, and only pilots are certified to fly. Write each of the following **queries in SQL**.

1. Find the names of aircraft such that all pilots certified to operate them earn more than 80,000.
2. For each pilot who is certified for more than three aircraft, find the eid and the maximum cruisingrange of the aircraft that he (or she) is certified for.
3. Find the names of pilots whose salary is less than the price of the cheapest route from Los Angeles to Honolulu.
4. For all aircraft with cruisingrange over 1,000 miles, find the name of the aircraft and the average salary of all pilots certified for this aircraft.
5. Find the names of pilots certified for some Boeing aircraft.

4. (a). Consider Schema: Student (RollNo, Name, Course, Address, email, Ph)
Write and explain a PL/ SQL program to check weather a given student rollno does exist in the table or not. **12**

OR

(b). With a neat and clean diagram elaborate High Level SQL query processing steps. **12**

5. (a). Write algorithm to simulate Read, Write and Unlock state of shared and exclusive locks. **12**

OR

(b). Consider following concurrent schedule: **12**

Transaction T_1	Transaction T_2	Transaction T_3
		read_item(Y); read_item(Z);
read_item(X); write_item(X);		
		write_item(Y); write_item(Z);
	read_item(Z);	
read_item(Y); write_item(Y);		
	read_item(Y); write_item(Y); read_item(X); write_item(X);	

Time

Determine step by step whether the given schedule is serializable or not? If serializable then find the corresponding serial schedule too. If not serializable then provide reason for the same.

PART B – (40 Marks)

6. What is total participation of an entity? How it is represented in ER diagram? Explain with an example. **8**
7. For which type of queries you will be using divide-by (÷) operation in relational algebra. Provide some examples. **8**
8. What is the difference between Cartesian product and simple join of two tables? Explain with examples. **8**
9. Draw and compare node structure of B-Tree and B^+-Tree. **8**
10. Does Strict-2PL protocol guarantee serializability or recoverability or both or not both? If yes then explain. If not then provide reasons. **8**

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TERM END EXAMINATIONS (TEE) – August 2024

Programme	:	**B.Tech.**	**Semester**	:	**Fall Semester 2024-2025**
Course Name	:	**DATABASE MANAGEMENT SYSTEM**	**Course Code**	:	**CSE3001**
Date/Session	:	**27 Aug 2024/Session-I**	**Slot**	:	**B11+B12+B13+E11+E12**
Time	:	**3 Hrs.**	**Max. Marks**	:	**100**

Answer ALL the Questions

Q. No.		Question Description	Marks

PART A – (60 Marks)

1 (a) Discuss the level of Data Abstraction in the context of the three-layer architecture of a Database Management System. 12

OR

(b) Design ER Diagram: Assume we have the following application that models teams, the games they play, and the players in each team. In the design, we want to capture the following: We have a set of teams, each team has an ID (unique identifier), name, main stadium, and to which city this team belongs. 12

Each team has many players, and each player belongs to one team. Each player has a number (unique identifier), name, DoB, start year, and shirt number that he uses. Teams play matches, in each match there is a host team and a guest team. The match takes place in the stadium of the host team.

For each match we need to keep track of the following:

Each match has exactly three referees. For each referee we have an ID (unique identifier), name, DoB, years of experience. One referee is the main referee and the other two are assistant referee.

- The date on which the game is played
- The final result of the match.
- The players participated in the match. For each player, how many goals he scored, whether or not he took yellow card, and whether or not he took red card.
- During the match, one player may substitute another player. We want to capture this substitution and the time at which it took place.

Design an ER diagram to capture the above requirements. State any assumptions you have that affects your design.Make sure cardinalities and primary keys are clear.

2 (a) Consider the following schema and write **Relational Algebra** queries. 12

Suppliers (sid: integer, sname: string, address: string)
Parts (pid: integer, pname: string, color: string)
Catalog (sid: integer, pid: integer, cost: real)

The key fields are underlined and domain of each field is listed after the field name
1) Find the name of suppliers who supply some red parts.

1) Find the name of suppliers who supply some red parts.
2) Find the sids of suppliers who supply some red or green parts.
3) Find the sids of suppliers who supply some red part and some green part.
4) Find the sids of suppliers who supply every part
5) Find the sids of suppliers who supply every red or green part
6) Find the sids of suppliers who supply every red part

OR

(b) Explain the issues caused by redundancy and the concept and necessity of normalization. 12

3 (a) Write the **SQL queries** for the following relations keep track of airline flight information: Flights(flno: integer, from: string, to: string, distance: integer, departs: time, arrives: time, price: integer) 12
Aircraft(aid: integer, aname: string, cruisingrange: integer) Certified(eid: integer, aid: integer)
Employees(eid: integer, ename: string, salary: integer)

1. Find the names of aircraft such that all pilots certified to operate them earn more than 80,000.
2. For each pilot who is certified for more than three aircraft, find the eid and the maximum cruisingrange of the aircraft that he (or she) is certified for.
3. Find the names of pilots whose salary is less than the price of the cheapest route from Los Angeles to Honolulu.
4. For all aircraft with cruisingrange over 1,000 miles, find the name of the aircraft and the average salary of all pilots certified for this aircraft.
5. Find the names of pilots certified for some Boeing aircraft
6. Find the aids of all aircraft that can be used on routes from Los Angeles to Chicago.

OR

(b) Discuss the commands of Data Definition language, Data manipulation Language, Transaction Control Language and Data Control language using suitable examples? 12

4 (a) How optimization can improve the performance of a database server? Explain the various types of query optimization processes used in a DBMS. 12

OR

(b) How does RAID assist in data backup and recovery mechanisms? Explain the different levels of RAID utilized in the DBMS system. 12

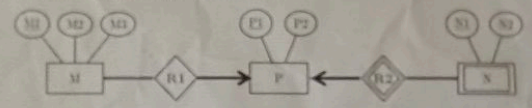
5 (a) Discuss the role of transactions in achieving concurrency control in the database server. Explain and compare conflict serializability and non-conflict serializable schedules with suitable examples. 12

OR

(b) Discuss the importance of Locking Protocols in a Database Management System and differentiate between PCL, 2PL, and S2PL protocols with suitable examples. 12

PART B – (40 Marks)

6 Consider the following ER diagram: 8



Find minimum number of tables needed to represent M, N, P, R1 and R2.

7 For the Relation X(PQRS) the functional dependencies are (QR→S, R→P, S→Q) and R has been decomposed into two schemas Y(PR) and Z(QRS). Answer the following question with proper explanation? 8

a) Find the number of possible candidate keys.
b) Determine the normal form of the state.
c) Identify if the given decomposition is lossy or lossless.
d) Determine if the given decomposition is dependency preserving or not.

8 Write a SQL Trigger that inserts the employee record into the Historical_Employee table when an employee is deleted from the Current_Employee table. 8

9 Create a stored procedure that generates a report on employees who earn a salary greater than 50k and belong to the age group between 30 and 45. The database scheme is as follows: 8
Employee (id, name, city, salary, age)

10 Consider the transactions T1, T2, and T3 and the schedules S1 and S2 given below.

T1: r1(X); r1(Z); w1(X); w1(Z)

T2: r2(Y); r2(Z); w2(Z)

T3: r3(Y); r3(X); w3(Y)

S1: r1(X); r3(Y); r3(X); r2(Y); r2(Z); 8

w3(Y); w2(Z); r1(Z); w1(X); w1(Z)

S2: r1(X); r3(Y); r2(Y); r3(X); r1(Z);

r2(Z); w3(Y); w1(X); w2(Z); w1(Z)

Test the Conflict Serializability of both S1 and S2 schedules?

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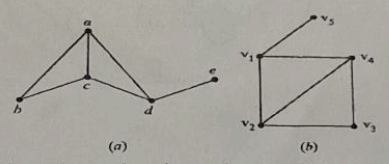
TERM END EXAMINATIONS (TEE) – May 2024

Programme	:	B.Tech.	Semester	:	Winter 2023-24
Course Name/ Course Code	:	Discrete Mathematics & Graph Theory/ MAT2002	Slot	:	A11+A12+A13
Time	:	3 Hrs.	Max. Marks	:	100

Answer ALL the Questions

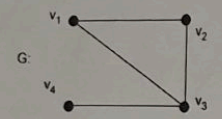
Q. No.		Question Description	Marks
		PART A – (60 Marks)	
1	(a)	Draw a directed graph and equivalent Hasse diagram of the lattice $\{P(S), \subseteq\}$ in which the join and meet are the operations $\cup$ and $\cap$ respectively, where $S = \{a, b, c\}$.	12
		OR	
	(b)	Find the conjuctive normal form of the Boolean expression using algebraic method: $f(x, y, z) = (yz + xz')(xy' + z)'$	12
2	(a)	Show that $(t \wedge s)$ can be derived from the premises $p \to q,\ q \to \sim r,\ r,\ p \vee (t \wedge s)$.	7
	(b)	Prove that $(\sim p \vee q) \wedge (p \wedge (p \wedge q) \equiv p \wedge q$.	5
		OR	
	(c)	Determine which of the following compound propositions are tautology and which of them are contradictions: 1. $((p \to q) \wedge (q \to r)) \to (p \to r)$ 2. $\sim(q \to r) \wedge r \wedge (p \to q)$, where $\sim$ is negation.	12
3	(a)	Prove that the graphs shown in the following figures are isomorphic:	6



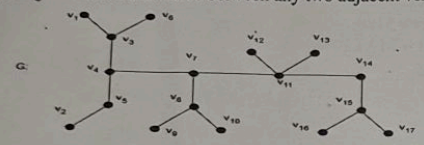
(a) (b)

	(b)	Show that the premises: "A student in section C of the course has not read the book." "Everyone in section C of the course passed the first exam." Imply the conclusion, "Someone who passed the first exam, has not read the book."	6
		OR	

(c) Find the number of paths of length 4 from the vertex v_2 to vertex v_4 in the undirected graph G. Identify those paths from the graph. 12

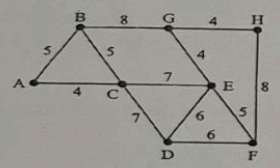


4 (a) Find the eccentricity of all vertices, radius, diameter and centre of the graph G given below. It is given that the distance between any two adjacent vertices is 1. 12

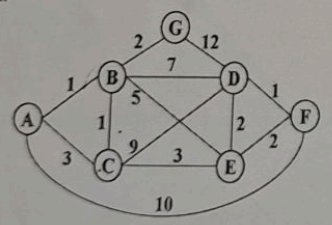


OR

(b) Find a minimum spanning tree for the connected weighted graph shown in the following figure using Prim's Algorithm: 12



5 (a) Find the shortest path between A and F in the undirected graph shown below using Dijkstra's algorithm. 12



OR

(b) Draw the following graphs: 6

1. A graph which has a Hamiltonian circuit but not a Euler circuit.
2. A graph that has neither a Euler circuit nor a Hamiltonian circuit.

(c) Draw the graph G whose incidence matrix M is: 6

$$M = \begin{array}{c} v_1 \\ v_2 \\ v_3 \\ v_4 \end{array} \begin{bmatrix} 1 & 1 & 1 & 0 & 0 \\ 1 & 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 1 & 1 \end{bmatrix}$$

PART B – (40 Marks)

6 For the poset [{3, 5, 9, 15, 24, 45}; divisor of], find 8

a) The maximal and minimal elements
b) The greatest and the least elements
c) The upper bounds and LUB of {3, 5}
d) The lower bounds and GLB of {15,45}.

7 Let $Q(x, y)$ be the statement $x + y = x - y$. If the domain is all integers then find the truth value of the following. 8

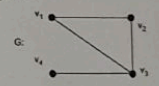
1. $\forall x \exists y\, Q(x, y)$
2. $\forall x \forall y\, Q(x, y)$
3. $\exists x \forall y\, Q(x, y)$
4. $\exists x \exists y\, Q(x, y)$.

Also, find the negation of the above statements.

8 Draw the graph having the following matrix as its adjacency matrix 8

$$\begin{bmatrix} 0 & 1 & 2 & 3 \\ 1 & 0 & 3 & 2 \\ 2 & 3 & 0 & 1 \\ 3 & 2 & 1 & 0 \end{bmatrix}$$

9 Define tree. Give two examples of a tree with 6 and 8 vertices respectively. Draw all the spanning trees of the graph G 8



10 Draw the following graphs: 8

1. Two 3-regular graphs with six vertices.
2. Two complete graph with 5 and 6 vertices

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MID TERM EXAMINATIONS – April 2024

Programme	:	**B.Tech.**	Semester	:	**Winter 2023-24**
Course Title/ Course Code	:	**Digital Logic Design/ ECE2002**	Slot	:	**C11+C12+C13**
Time	:	**1 ½ hours**	Max. Marks	:	**50**

Answer all the Questions

Q.No.	Sub. Sec.	Question Description	Marks
1	(a)	Perform the following Convert $(3EC9)_{16}$ to octal Convert $(141.14)_8$ to decimal Subtract -30 + 24 using 9's complement	5
	(b)	Write any 6 Boolean properties and simplify the following expression using them. $\overline{\overline{\overline{A}C + A\overline{B} + \overline{\overline{B} + C}}}$	5
2	(a)	Write the POS expression for the given truth table and then draw the gate circuit diagram corresponding to the expression.	5
	(b)	What are the classification digital logic families and explain TTL NAND gate logic with neat circuit.	5
3	(a)	Minimize the number of gates in the given circuit while maintaining its functionality	5

A	B	C	Output
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1

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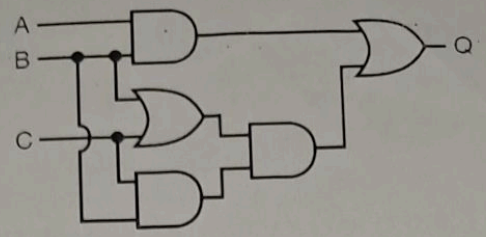

(b) Simplify the following expression using K-Map

$$f(w,x,y,z) = \sum m(2,3,7,10,11) + \sum d\ (14,15)$$

$$f(a,b,c,d,e) = \sum m(0,4,8,12,16,20,24,28)$$ 5

4 (a) Implement the sum output of full adder using 4×1 Multiplexer. 5

(b) Consider a scenario where a group of data bits needs to be transmitted over a communication channel with even parity. Describe the circuitry required to ensure that the transmitted data conforms to the even parity protocol. (Assume the no of bits including parity bit is 4) 5

5 Discuss the behaviour of a sequential logic circuit that retains binary information, based on the behaviour of its two inputs and current state. Its main operation involves toggling its output states under specific input conditions. Explore how this circuit can be analysed in terms of its characteristic table, characteristic equation, and timing diagram. 10

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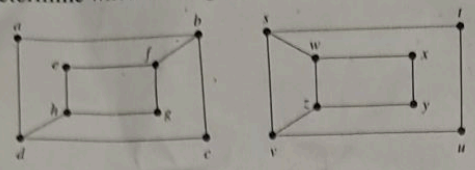
MID TERM EXAMINATIONS – April 2024

Programme	:	B.Tech.	Semester	:	Winter 2023-24
Course Title/ Course Code	:	Discrete Mathematics And Graph Theory/ MAT2002	Slot	:	E11+E12+E13
Time	:	1 ½ hours	Max. Marks	:	50

Answer all the Questions

Q.No.	Sub. Sec.	Question Description	Marks
1	(a)	If R is the equivalence relation on the set $A = \{1,2,3,4,5,6,7\}$ defined by aRb if $(a - b)$ is a multiple of 3, find the partition of A induced by R.	4
	(b)	If R is a relation on $A = \{1,2,3\}$ such that $(a,b) \in R$, if and only if $a + b =$ even, find the relational matrix M_R. Find also relational matrices $M_{R^{-1}}$ and M_{R^2}, where M_R represents matrix of R.	6
2	(a)	If S_n is the set of all positive divisors of the positive integer n and D is the relation of 'division', viz. aDb if and only if a divides b, then 1. Draw the Hasse diagram of $\{S_{42}, D\}$. 2. Show that $\{S_{42}, D\}$ is a lattice.	6
	(b)	Find the conjuctive normal form of the Boolean expression $f(x,y,z) = (yz + xz')(xy' + z)'$.	4
3		Determine which of the following compound propositions are tautology and which of them are contradictions, using truth tables: 1. $((p \to q) \wedge (q \to r)) \to (p \to r)$ 2. $\neg(q \to r) \wedge r \wedge (p \to q)$, where $\neg$ is negation.	10
4	(a)	Show that $(p \wedge q) \wedge (p \to r) \wedge (q \to r) \Longrightarrow r$ without using truth tables.	5
	(b)	What are the negations of the statements "There is an honest politician" and "All Americans eat cheeseburgers".	3
	(c)	Let P (x,y) be the statement "x + y = y + x." What are the truth values of the quantifications $\forall x \forall y P(x,y)$ and $\forall y \forall x P(x,y)$ where the domain for all variables consists of all real numbers?	2
5	(a)	Define complete graph. Give two examples of complete graph. Also, find the number of edges in a complete graph with 15 vertices.	5

(b) Determine whether the graphs shown below are isomorphic.



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SUPPLEMENTARY EXAMINATIONS – February 2024

Programme	:	**B. Tech.**	**Semester**	:	**Fall 2023-24/ Trimester I/IV 2023-24**
Course Title	:	**Applied Numerical Methods**	**Course Code**	:	**MAT2003**
Time	:	**3 Hrs.**	**Max. Marks**	:	**100**

Answer ALL the Questions

Q. No.		Question Description	Marks
		PART A – (60 Marks)	
1	(a)	Discuss the convergence and solve the following system of equations by using Gauss-Seidel iteration method (up-to 4 iterations) $5x + 2y + z = 12$ $x + 4y + 2z = 15$ $x + 2y + 5z = 20$	12
		OR	
	(b)	Farmers A, B and C completed their harvesting. For A from 3 top-grade rice paddies, 2 medium-grade and 1 low-grade the combined yield is 39 ton of grain. For B from 2 top-grade rice paddies, 3 medium-grade and 1 low-grade the combined yield is 34 ton of grain. For C from 1 top-grade rice paddies, 2 medium-grade and 3 low-grade the combined yield is 26 ton of grain. Using Gauss elimination method find the yield of the paddy of each grade.	12
2	(a)	Find the positive real root of $\cos x = xe^x$ by using bisection methods. Also find the rate of convergence.	12
		OR	
	(b)	Evaluate the following (correct to four decimal places) by Fixed point iteration Method; $x \log_{10} x = 1.2$	12
3	(a)	Find the cubic polynomial by the Newton's divided formula which takes the following values;	12

x	300	304	305	307
F(x)	2.4771	2.4829	2.4843	2.4871

OR

(b) Find the cubic polynomial by using Newton Backward Interpolation formula which takes on the following values and hence evaluate f (3.8) — 12

x	0	1	2	3	4
f(x)	1.00	1.50	2.20	3.10	4.60

4 (a) Find first and second derivatives of the following tabulated functions at the point x = 1.5 12

x	1.5	2	2.5	3	3.5	4
F(x)	3.375	7.0	13.625	24	38.875	59.0

OR

(b) Compute the value of $\int_{0.2}^{1.4}(sinx - logx + e^x)\,dx$ by using; 12

(a) Simpson's (1/3) rule.
(b) Simpson's (3/8) rule.
(c) Two point quadrature formula.
(d) Three point quadrature formula.

5 (a) Using Euler's modified formula, find an approximate value of y when $x = 0.06$, given that 12

$\frac{dy}{dx} = x^2 + y$, and y(0) = 1, taking the interval 0.03.

OR

(b) Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ in 0< x< 5 ,$t \geq 0$ given that u(x,0)=20, u(0,t) = 0 ,u(5,t) = 100. Compute u for the time step with h=1 by Crank Nicholson method for one step. 12

PART B – (40 Marks)

6 Using the Gauss elimination method, solve the following equation till three decimal places: 8

7x + 52y + 13z = 104
83x + 11y - 4z = 95
3x + 8y + 29z = 71

7 Find a real root of the equation x^3 - 2x - 5 by Secant method correct to three decimal places. 8

8 Estimate the missing term in the following table: 8

x	1	2	3	4	5	6
f(x)	?	8	3	0	-1	0

9 Find the following value (a) Find $\frac{dy}{dx}$ at x = 1.1 (b) Find $\frac{d^2y}{dx^2}$ at 1.4 from the following table: 8

x	1.0	1.1	1.2	1.3	1.4	1.5
y	7.989	8.403	8.781	9.129	9.451	9.750

10 Apply Runga Kutta method of fourth order to solve: 8

$$\frac{dy}{dx} = 2x^3 + y : y(1) = 2 \text{ for } x = 1.1 , 1.2$$

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TERM END EXAMINATIONS (TEE) – January 2024

Programme	:	B.Tech.	Semester	:	Interim 2023-24
Course Title/ Course Code	:	Applied Numerical Methods/MAT2003	Slot	:	A24+B24+C21+F21+F22
Time	:	3 Hrs.	Max. Marks	:	100

Answer ALL the Questions

Q. No.		Question Description	Marks
		PART A – (60 Marks)	
1	(a)	Solve the following system of equation using Gauss – Elimination method and correct the solution into four decimal places. $$x+y+z=9$$ $$2x-3y+4z=13$$ $$3x+4y+5z=40.$$	12
		OR	
	(b)	Solve the following system of equation using Thomas algorithm and correct the solution into four decimal places. $$5x_1+2x_2=8$$ $$-3x_1+6x_2-2x_3=15$$ $$-4x_2+7x_3=-6$$	12
2	(a)	Find the real root of the equation $x^3+x^2-1=0$ by iteration method.	12
		OR	
	(b)	If an approximate root of the equation $x(1-\log_e x)=0.5$ lies between 0.1 and 0.2. Find the value of the root correct to four decimal places.	12
3	(a)	A function $f(x)$ is given by the following table. Find $f(0.2)$ by a suitable Euler's interpolation formula.	12

x	0	1	2	3	4	5	6
$f(x)$	176	185	194	203	212	220	229

		OR			
	(b)	Apply Lagrange's interpolation to find the age corresponding to the annuity value 13.6 from the given table.			12

Age (x)	30	35	40	45	50
Annuity value (y)	15.9	14.9	14.1	13.3	12.5

4	(a)	Applying Gauss's quadrature 3-point formula, evaluate $\int_5^{12}\frac{1}{x}dx$, correct it in to five decimal places.			12
		OR			
	(b)	Evaluate $I=\int_0^{\frac{1}{2}}\frac{x}{\sin x}dx$, correct to 3 decimal places using Romberg's method.			12
5	(a)	Using Euler's method solve for y at $x=0.1$ from $\frac{dy}{dx}=x+y+xy, y(0)=1$ taking			12

$h = 0.025$. Correct it in to five decimal places.

OR

(b) The differential equation $\frac{dy}{dx} = y - x^2$ is satisfied by $y(0) = 1$, $y(0.2) = 1.12186$, $y(0.4) = 1.46820$, $y(0.6) = 1.7379$. Compute the value of $y(0.8)$ by Milne's predictor-corrector formula. Correct the solution in to four decimals. 12

PART B – (40 Marks)

6 Verify the dominance property of the following system of equations and find the solution using Gauss-Seidel method and correct the solution into four decimal places. 8

$$5x_1 - x_2 + 2x_3 = 12$$
$$3x_1 + 8x_2 - 2x_3 = -25$$
$$x_1 + x_2 + 4x_3 = 6$$

7 Find the root of the equation $xe^x = \cos x$ using the secant method correct to four decimal places. 8

8 Find the cubic spline for the data: 8

x	1	2	3
y	-6	-1	16
	y_0	y_1	y_2

Hence evaluate $y(1.5)$ given that $y_0'' = y_2'' = 0$.

9 By dividing the range in to ten equal parts, evaluate $\int_0^{\pi} \sin x \, dx$ by using Simpson's $\frac{1}{3}$ rule. Correct the solution in to four decimal places. 8

10 Solve the differential equation $\frac{d^2y}{dx^2} - y = 2$ where $y(0) = 0$, $y(1) = 1$ with $h = \frac{1}{4}$ using finite difference method. 8

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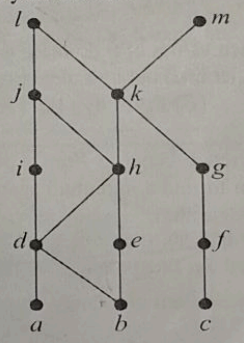
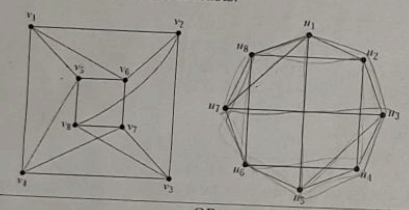
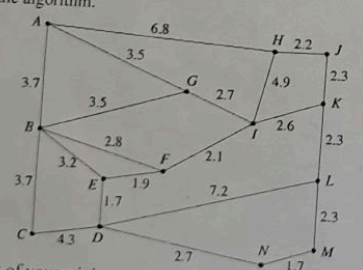
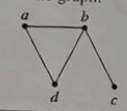
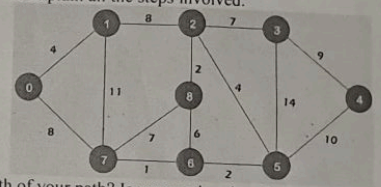
TERM END EXAMINATIONS (TEE) – May 2024

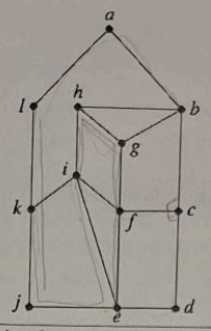
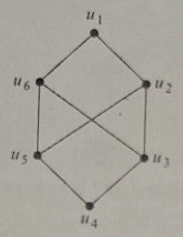
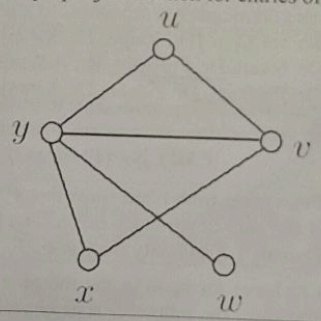
Programme	:	B.Tech.	Semester	:	Winter Semester 2023-24
Course Title/ Course Code	:	Discrete Mathematics and Graph Theory/ MAT2002	Slot	:	E11+E12+E13
Time	:	3 Hrs.	Max. Marks	:	100

Answer ALL the Questions

Q. No.		Question Description	Marks
		PART A – (60 Marks)	
1	a	Let $f(x) = \begin{cases} -2024 & if -2024 \le x \le 0 \\ x+2024 & if \quad 0 < x \le 2024 \end{cases}$ and $g(x) = (f(\lvert x\rvert) - \lvert f(x)\rvert)/2$. Is the function $g : [-2024, 2024] \to [-2024, 2024]$ (i) one-one? (ii) onto? Justify your answer.	6
	b	Let $A = \{-4, -3, -2, 0, 1, 3, 4\}$ and $R = \{(a, b) \in A \times A : b = \lvert a\rvert \text{ or } b^2 = a + 1\}$ be a relation on A. Then find the minimum number of elements, that must be added to the relation R so that it becomes reflexive and symmetric.	6
		OR	
	c	Answer the questions for the partial order represented by the below Hasse diagram, give argument in the favour of your answer:  (i) Is there a greatest element? (ii) Is there a least element? (iii) Find all upper bonds of $\{a, b, c\}$. (iv) Find the least upper bond of $\{a, b, c\}$, if it exists. (v) Find all lower bounds of $\{f, g, h\}$. (vi) Find the greatest lower bounds of $\{f, g, h\}$, if it exists.	12

2	a	i. Translate the given statement into propositional logic using propositional variables: You can upgrade your operating system only if you have a 32-bit processor running at 1 GHz or faster, at least 1 GB RAM, and 16 GB free hard disk space, or a 64-bit processor running at 2 GHz or faster, at least 2 GB RAM, and at least 32 GB free hard disk space. ii. Use De Morgan's laws to write the negation of $-1 < x \leq 4$.	12
		OR	
	b	Determine whether the statements in (i) and (ii) are logically equivalent. Assume x is a particular real number. (i) $x < 2$ or it is not the case that $1 < x < 3$. (ii) $x \leq 1$ or either $x < 2$ or $x \geq 3$.	6
	c	State the converse, contrapositive, and inverse of the conditional statement: A positive integer is a prime only if it has no divisors other than 1 and itself.	6
3	a	Determine whether two given graphs are isomorphic. Exhibit an isomorphism or provide a rigorous argument that none exists. 	12
		OR	
	b	(i) For which values of n do these graphs have an Euler circuit (also known as Euler line)? Give argument behind your answer. $(\alpha)\ K_n \quad (\beta)\ C_n \quad (\gamma)\ W_n$. (ii) For which values of n do these graphs have an Euler path (also known as open Euler line) but no Euler circuit? Give argument behind your answer. $(\alpha)\ K_n \quad (\beta)\ C_n \quad (\gamma)\ W_n$.	12
4	a	Highlight the difference between Prim's algorithm and Kruskal's algorithm. Use Kruskal's algorithm to find a minimum spanning tree for the weighted graph. Write all the steps of the algorithm.  What is the weight of your minimum spanning tree? Give a spanning tree which is	12

		not minimum spanning tree. What is the weight of this spanning tree?	
		OR	
	b	Find all possible spanning trees for the graph. 	6
	c	Draw a rooted tree with at least 10 vertices, where the degree of each vertex does not exceed 3. Identify the root, the parent of each vertex, the children of each vertex, siblings, the internal vertices, and the leaves. How many internal vertices and leaves are there in the tree?	6
5	a	Find the shortest path from the vertex 0 to the vertex 4 in the weighted graph using Dijkstra algorithm. Explain all the steps involved.  What is the length of your path? Is your path unique?	12
		OR	
	b	The mathematics department at VIT Bhopal University has six committees, each meeting once a month. How many different meeting times (minimum) should be used to ensure that no member is scheduled to attend two meetings at the same time if the committees are C_1 = {Dr. Rahul, Dr. Swati}, C_2 = {Dr. Rahul, Dr. Swati, Dr. Kiran}, C_3 = {Dr. Swati, Dr. Prashant, Dr. Adnan}, C_4 = {Dr. Rahul, Dr. Adnan, Dr. Kiran}, C_5 = {Dr. Prashant, Dr. Adnan, Dr. Kiran}, and C_6 = {Dr. Swati, Dr. Adnan, Dr. Kiran}?	12
		PART B – (40 Marks)	
6		(i) Without using truth table, show that $x\bar{y} + y\bar{z} + \bar{x}z = \bar{x}y + \bar{y}z + x\bar{z}$. (ii) Find the sum-of -product expansions of the Boolean function $F(x, y, z)$ that equals 1 if and only if $xy = 0$.	8
7		You are about to leave for class in the morning and discover that you don't have your glasses. You know the following statements are true: i. If I was reading the newspaper in the kitchen, then my glasses are on the kitchen table. ii. If my glasses are on the kitchen table, then I saw them at breakfast. iii. I did not see my glasses at breakfast. iv. I was reading the newspaper in the living room or I was reading the newspaper in the kitchen. v. If I was reading the newspaper in the living room then my glasses are on the coffee table. Where are the glasses?	8
8		For the graph, given below, determine (i) whether Dirac's theorem can be used to	8

		show that the graph has a Hamilton circuit, (ii) whether Ore's theorem can be used to show that the graph has a Hamilton circuit, and (iii) whether the graph has a Hamilton circuit. Give argument behind your answer. 	
9		Give two cut-sets of different size for the graph. Give a set of edges that cuts the graph but not a cut-set. 	8
10		Determine the adjacency matrix of the graph. Then determine A^3 without multiplying matrices. Give proper justification for entries of A^3. 	8

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MID TERM EXAMINATIONS – March 2024

Programme	:	**B.Tech.**	Semester	:	**Winter 2023-24**
Course Title / Course Code	:	**Engineering Design and Modelling / MEE2014**	Slot	:	**A11+A12+A13**
Time	:	**1 ½ hours**	Max. Marks	:	**50**

Answer all the Questions

Q.No.	Sub. Sec.	Question Description	Marks
1		Demonstrate the Dieter Ram's principles of good design and analyse each of the principles for the design of a wardrobe. Draw a sketch as well.	10
2		Why does aesthetic design matter? How does aesthetic design differ from functional design? Illustrate an example, where the designer has to compromise between "Aesthetic and Functionality".	10
3		Redesign an office chair adopting the concept of SCAMPER. Draw rough sketch at each step.	10
4		How can you handle the amount of risk involved in a project?	10
5		A group of students from the 2022 batch thinking to design a new VTOP portal for VIT Bhopal. Students have developed the website as well and now they are thinking to conduct usability testing for the website. Investigate the complete steps in detail.	10

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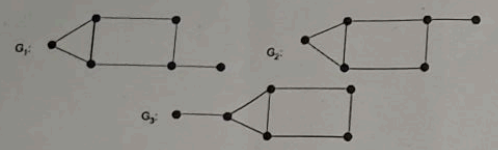
TERM END EXAMINATIONS (TEE) – May 2024

Programme	:	B.Tech.	Semester	:	Winter Semester 2023-24
Course Name/ Course Code	:	Discrete Mathematics & Graph Theory / MAT2002	Slot	:	A21+A22+A23
Time	:	3 Hrs.	Max. Marks	:	100

Answer ALL the Questions

Q. No.		Question Description	Marks
		PART A – (60 Marks)	
1	(a)	Let the $D_{120} = \{1,2,3,4,5,6,8,10,12,15,20,24,30,40,60,120\}$ and let the relation '$\leq$' be the relation / (divides) be a partial ordering on D_{120}. i. Draw the Hasse Diagram of D_{120}. ii. Determine the GLB of B, where $B = \{4,6,10\}$. iii. Determine the LUB of B, where $B = \{4,6,10\}$. iv. Determine the GLB of B, where $B = \{12,20,30\}$. v. Determine the LUB of B, where $B = \{12,20,30\}$.	12
		OR	
	(b)	Let $A = \{1,2,3\}$. Determine whether the relation R, whose matrix M_R is given, is an equivalence relation or not: $(a)\ M_R = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & 1 & 1 \end{bmatrix}$ $(b)\ M_R = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$ Also find the $M_{R^{-1}}$ and $M_{\bar{R}}$ for both the matrices (a) and (b).	12
2	(a)	Prove that the following arguments are valid using the rules of inferences: i. $p \to \sim q,\ r \to q,\ r\ \therefore\ \sim p$ ii. $p \vee (q \to p),\ \sim p \wedge r\ \therefore\ \sim q$	12
		OR	
	(b)	Express the following propositions X, Y symbolically, and determine whether X and Y are logically equivalent or not by using truth table. X : If Alice is both smart and honest, then she is not intelligent. Y : If Alice either smart or not intelligent, then she is not honest.	12

3 (a) Determine which pairs of the graphs G_1, G_2 and G_3 are isomorphic. 12



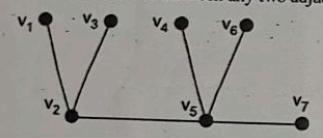
OR

(b) Write short notes on 12

i. Euler graph.
ii. Hamiltonian graph.
iii. Regular graph.
iv. Complete Graph.

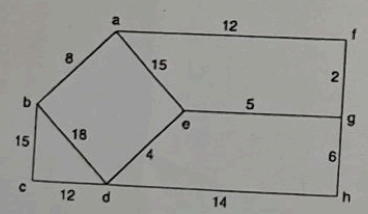
Also, give an example of a graph with vertices greater than or equal 8 such that the graph should satisfy above four properties.

4 (a) Find the eccentricity of all the vertices, radius, diameter and centre of the graph given below. It is given that the distance between any two adjacent vertices is 1. 12

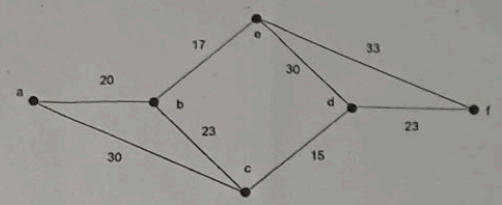


OR

(b) Find a minimum spanning tree for the connected weighted graph shown in the following figure using Kruskal's Algorithm: 12

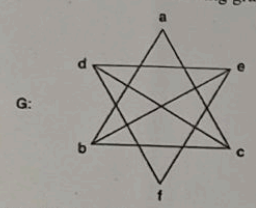


5 (a) For the graph shown below, use Dijkstra's algorithm to compute the shortest path between a and f: 12



OR

(b) Determine the planar representation of the following graph. 4



(c) Draw the graph G corresponding to each adjacency matrix: 8

$$(a)\ A = \begin{bmatrix} 0 & 1 & 0 & 1 & 0 \\ 1 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 \\ 1 & 1 & 1 & 0 & 1 \\ 0 & 1 & 1 & 1 & 0 \end{bmatrix}; \quad (b)\ A = \begin{bmatrix} 1 & 3 & 0 & 0 \\ 3 & 0 & 1 & 1 \\ 0 & 1 & 2 & 2 \\ 0 & 1 & 2 & 0 \end{bmatrix}$$

PART B – (40 Marks)

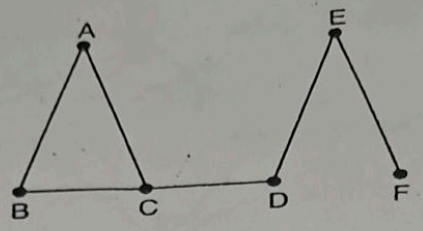
6 Let Z denote the set of integers and the relation R in Z be defined by "aRb" iff a-b is an even integer". Then, show that R is an equivalence relation. 8

7 A boy promises a girl "I will take you park on Monday if it is not raining". When the boy would be deemed to have broken his promise. Explain with the help of truth table. 8

8 Draw the following graphs: 8

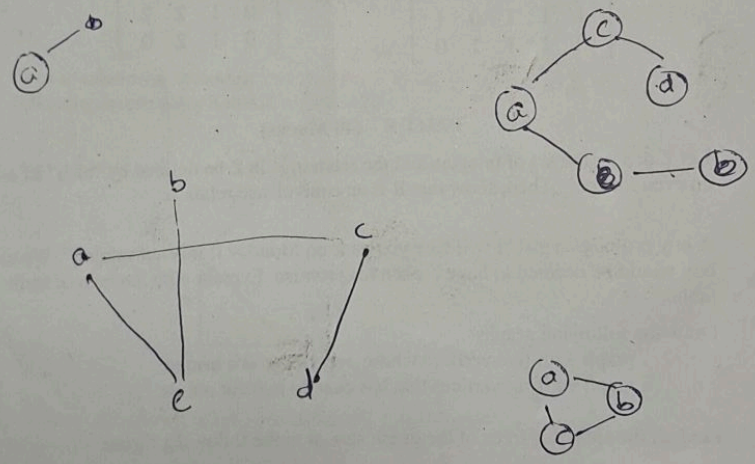
i. a graph with five vertices whose every edge is a bridge.
ii. a graph with six vertices that has exactly two cut points.

9 Find all the spanning trees of the graph shown in the following figure: 8



10 Find the connected components of a graph $G(V,E)$, where $V=\{a,b,c,d,e\}$ and 8

i. $E=\{(a,c),(b,e),(d,c),(e,a)\}$,

ii. $E=\phi$.

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