[-43]

objective?

	Course 1	Course 2	Course 3	Course 4
Prof 1	60	40	60	70
Prof 2	20	60	50	70
Prof 3	20	30	40	60
TA	30	10	20	40

b) Solve the following LPP using Simplex algorithm.

Max Z = -2x +3y

subject to

$x \leq 5$

$2x-3y \leq 6$

$x, y \geq 0$

Q9. a) Find the initial basic feasible solution of the following transportation problem using Vogel's Approximation method. **[7+8=15]**

	I	II	III	IV	Supply
A	21	16	25	13	11
B	17	18	14	23	13
C	32	27	18	41	19
Demand	6	10	12	15	

b) Three food products are available at costs of Rs. 10, Rs. 36 and Rs. 24 per unit, respectively. They contain 1,000, 4,000 and 2,000 calories per unit, respectively and 200, 900 and 500 protein units per unit, respectively. It is required to find the minimum-cost diet containing at least 20,000 calories and 3,000 units of protein. Formulate and solve the given problem as an LP problem. Write the dual and using the final simplex table of primal problem, write the solution to the dual problem.

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(Please write your Exam Roll No.) Exam Roll No. .....

END TERM EXAMINATION

FOURTH SEMESTER [B.TECH] JUNE 2024

Paper Code: BS-202 ***Subject: Probability, Statistics & Linear Programming***

Time: 3 Hours ***Maximum Marks: 75***

Note: Attempt five questionin all including Q.No1 which is compulsory. Select one question from each unit. Assume missing data if any. (Scientific Calculators are allowed).

Q1. Attempt all Questions:-

a) A batch of 25 injection-molded parts contains 5 that have suffered excessive shrinkage. If two parts are selected at random and without replacement, what is the probability that the second part selected is one with excessive shrinkage? **3**

b) State the Central Limit Theorem. **2**

c) Find the moment-generating function of a random variable X following an exponential distribution. **3**

d) Explain the general procedure for Hypothesis Testing. **2**

e) Solve the following LPP graphically. **5**

$$Min\, Z = -3x + 2y$$

subject to

$$x + y \leq 5$$

$$4 \geq x \geq 0, 6 \geq y \geq 1$$

UNIT I

Q2. a) Let the random variable X denote the current measured in a thin copper wire in milliamperes. Assume that the range of X is [0, 20 mA], and assume that the probability density function of X is $f(x) = 0.05, 0 \leq x \leq 20$. What is the probability that a measurement of current is between 5 and 10 milliamperes? Also, determine the mean and standard deviation of X. **[7+8=15]**

b) Customers are used to evaluate preliminary product designs. In the past, 95% of highly successful products received good reviews, 60% of moderately successful products received good reviews, and 10% of poor products received good reviews. In addition, 40% of products have been highly successful, 35% have been moderately successful, and 25% have been poor products.

i. If a new design attains a good review, then what is the probability that it will be a highly successful product?

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ii. If a product does not attain a good review, what is the probability that it will be a highly successful product?

Q3. a) A particularly long traffic light on your morning commute is green 20% of the time that you approach it. Assume that each morning represents an independent trial. **[7+3+5=15]**

i. Over five mornings, what is the probability that the light is green on exactly one day?

ii. Over 20 mornings, what is the probability that the light is green on exactly four days?

iii. Over 20 mornings, what is the probability that the light is green on more than four days?

b) Suppose the current measurements in a strip of wire are assumed to follow a normal distribution with a mean of 10 milliamperes and a variance of 4 (milliamperes)^2. What is the probability that a measurement will exceed 13 milliamperes?

c) Define Erlang Random Variable with its density function. Errors caused by contamination on optical disks occur at the rate of one error every 10^5 bits. Assume the errors follow a Poisson distribution. What is the probability that there are three or more errors within 10^5 bits?

UNIT II

Q4. a) Determine the value of c, and the covariance and correlation for the joint probability density function $f_{XY}(x, y) = c$ over the range $0 < x < 5, y > 0, and\ x - 1 < y < x + 1$. **[7+8=15]**

b) A sample of the percentage mole conversion of naphthalene to maleic anhydride follows: 4.2, 4.7, 4.7, 5.0, 3.8, 3.6, 3.0, 5.1, 3.1, 3.8, 4.8, 4.0, 5.2, 4.3, 2.8, 2.0, 2.8, 3.3, 4.8, 5.0.

i. Calculate the sample mean.

ii. Calculate the sample variance and standard deviation.

iii. Construct a box plot of the data

Q5. Suppose that, X is a random variable with mean μand variance σ^2. Let $X_1, X_2, \ldots, X_n$ be a random sample of size n from the population represented by X. Show that the sample mean $\bar{X}$ and sample variance S^2 are unbiased estimators of μ and σ^2, respectively **[15]**

UNIT III

Q6. a) Aircrew escape systems are powered by a solid propellant. The burning rate of this propellant is an important product characteristic. Specifications require that the mean burning rate must be 50 centimeters per second. We know that the standard deviation of burning rate is $\sigma = 2$ centimeters per second. The experimenter decides to specify a type I error probability or significance level of $\alpha = 0.05$ and selects a random sample of n = 25 and obtains a sample average burning rate of $\bar{x} =$ 51.3centimeters per second. What conclusions should be drawn? **[7+8=15]**

b) Assume that the two variables, compressive strength (x) and intrinsic permeability (y) of various concrete mixes and cures are related according to the simple linear regression model. Using the following data, calculate the least squares estimates of the slope and intercept.

$$n = 14, \sum y_i = 572, \sum y_i^2 = 23530, \sum x_i = 43$$
$$\sum x_i^2 = 157.42, \sum x_i y_i = 1697.80$$

Use the equation of the fitted line to predict what permeability would be observed when the compressive strength is 4.3

Q7. a) A random sample of 500 registered voters in Phoenix is asked if they favor the use of oxygenated fuels year-round to reduce air pollution. If more than 315 voters respond positively, we will conclude that at least 60% of the voters favor the use of these fuels. **[7+8=15]**

i. Find the probability of type I error if exactly 60% of the voters favor the use of these fuels.

ii. What is the type II error probability if 75% of the voters favor this action?

b) Obtain a regression plane by using multiple linear regressionto fit the data given below

x	1	2	3	4
y	0	1	2	3
z	12	18	24	30

UNIT IV

Q8. a) A head of department in a college has the problem of assigning courses to teachers with a view to maximize educational quality in his department. He has available to him one professor, two associate professors, and one teaching assistant (TA). Four courses must be offered. After appropriate evaluation, he has arrived at the following relative ratings (100 = best rating) regarding the ability of each instructor to teach each of the four courses. How should he assign his staff to the courses in order to realize his **[7+8=15]**

(Please write your Exam Roll No.) *Exam Roll No. .....*

END TERM EXAMINATION

FOURTH SEMESTER [B.TECH] JUNE 2024

Paper Code: CIC-206 **Subject: Theory of Computation**

Time: 3 Hours **Maximum Marks: 75**

Note: Attempt five questions in all including Q.No.1 which is compulsory. Assume missing data, if any.

Q1 Answer the following questions: **(2.5x10=25)**

a) Write any five Identity Rules for Regular Expressions?

b) What is the difference between Deterministic Finite Automata (DFA) and Non-Deterministic Finite Automata (NDFA)?

c) What is the disadvantages of unambiguous parse tree. Give an example.

d) Define the term context free grammar with an example?

e) Define instantaneous description of a PDA

f) Construct the CFG for generating the language $L=\{a^n b^n / n>=1\}$.

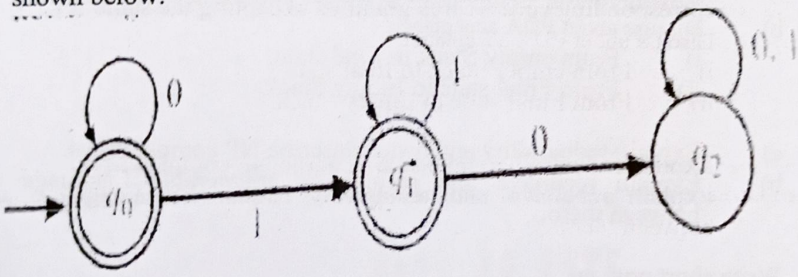
g) For the grammar S->A1B,A->0A | ε, B-> 0B | 1B| ε, give leftmost and rightmost derivations for the string 00101.

h) Prove graph coloring problem is NP complete.

i) Describe the Set of all Strings of 0's and 1's ending in 00 by Regular Expression.

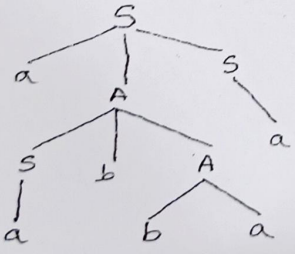
j) Construct a Regular Grammar G generating the regular expression 0*(0+1)?

Q2 a) Construct a Regular Expression for the FA (Using Method of Eliminate States) the shown below: **(6)**



b) Explain Pumping lemma for Context Free Languages. **(6.5)**

Q3 a) Find the left most and right most derivation corresponding to the tree. **(6)**



b) Construct a equivalent grammar G in CNF for the grammar G1 where G1 =({S,A,B},{a,b},{S->bA/aB,A->bAA/aS/a, B->aBB/bS/b},S) **(6.5)**

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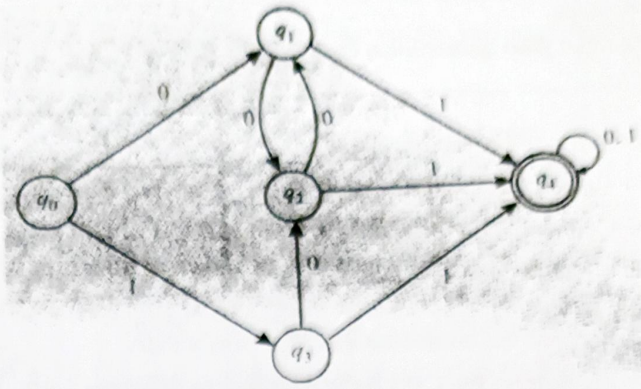
CIC-206

Q4 a) Write procedure for construction of Minimum Automata or State Minimization of DFA. **(6)**

b) Construct a minimum state automation equivalent to finite automation given in diagram. **(6.5)**



Q5 a) Consider the language $L = \{ww^R, \in L[(a+b)^*]\}$. Is this language CF? If yes is it deterministic or nondeterministic? **(6)**

b) Using pumping lemma. Prove that-Language L= ($0^p1^m2^p$ | p and m are arbitrary integers) is not regular. **(6.5)**

Q6 a) Construct a PDA accepting $\{a^n b^m a^n / m,n>=1\}$ by empty stack. Also construct the corresponding context-free grammar accepting the same set. **(6.5)**

b) Discuss about PDA acceptance **(6)**

i) From empty Stack to final state.

ii) From Final state to Empty Stack.

Q7 a) Explain reducibility and hence describe NP completeness. **(6)**

b) Explain recursive and recursively enumerable Language and the relationship between them. **(6.5)**

(4+4+4.5)

Q8 Write short note on

a) Arden theorem for Regular Expression

b) Church's Hypothesis for computability of Machine

c) Universal Turing Machine

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END TERM EXAMINATION

FOURTH SEMESTER [B.TECH] JUNE 2024

Paper Code: EEC-208 **Subject: Circuits and Systems**

Time: 3 Hours **Maximum Marks: 75**

Note: *Attempt five questions in all including Q.No.1 which is compulsory. Select one question from each unit.*

Q1 Attempt all questions:

a) Find the Fourier transform for $x(t) = \sin(\omega_c t)\, u(t)$ **(3)**

b) List the properties of ROC. **(3)**

c) Determine the impulse response of series and parallel RL circuit. **(3)**

d) Explain the AC circuit containing the inductor only. **(3)**

e) Explain short circuit and open circuit impedance in terms of ABCD parameters. **(3)**

UNIT-I

Q2 Examine the following system: Linear/Nonlinear, Causal/Non- Causal, Time Variant/Time-Invariant, and Static/Dynamic with examples. **(15)**

Q3 Find the laplace transform for following signals if $x(t) = e^{-4t}\, u(t)$. **(5×3=15)**

i) $y(t) = x(t + 2)$

ii) $y(t) = t.x(t)$

iii) $y(t) = dx(t)/dt$.

UNIT-II

Q4 a) Derive the Transient Response in series R–L–C circuit with sinusoidal excitation for second order circuit. **(7)**

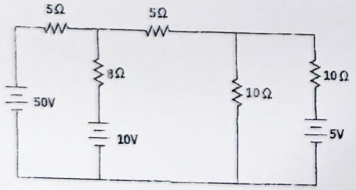
b) A step voltage of 20 V is applied at $t = 0$ in an R–L–C series circuit where R = 5ohm, L= 1H and C = 1F. Calculate $i(t)$ with and without Laplace Transform. **(8)**

Q5 a) Find the step response (by applying a constant voltage source at the close of a switch) of a Parallel RLC circuit. **(8)**

b) Determine the step response of series and parallel RC circuits. **(7)**

UNIT-III

Q6 For the Circuit shown below, determine the current in each branch using Nodal and Loop analysis. **(15)**



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EEC-208

Q7 Determine the value of current in 6Ω resistor using Thevenin's theorem and Norton's theorem. **(15)**

UNIT-IV

Q8 a) Explain the term 'tie-set' and 'tie-set matrix' of a network with an illustrative example. **(5)**

b) Derive and prove the following Matrix Equation with an appropriate example

$I_b = B^T I_L$

Where, B is the Tie-set matrix, I_b and I_L are the branch current respectively **(10)**

Q9 a) Derive the transmission parameters of Two-port networks. Also, determine the condition of Reciprocity and symmetry for ABCD parameter. **(8)**

b) Explain the parallel and cascade connection of Two-port networks. **(7)**

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2ND TERM EXAMINATION

FOURTH SEMESTER [B.TECH] JUNE 2024

Paper Code: CIC-210 **Subject: Database Management System**

Time: 3 Hours **Maximum Marks: 75**

Note: Attempt questions in all including Q.No.1 which is compulsory. Select one question from each Unit.

Q1 a) Give an example of mapping of generalization or specialization into relation schemas Summarize the steps involved in converting the ER constructs to relational schema. **(3)**

b) What is a Weak Entity type? Explain the role of partial key in design of weak entity type. **(3)**

c) Consider a relational schema with the following tables:
Employee (EmpID, EmpName, DeptID)
Department (DeptID, DeptName)
Write a relational calculus expression to retrieve the names of all employees who work in the "Sales" department. **(3)**

d) Why is the domain key normal form (DKNF) known as ultimate normal form? **(3)**

e) Compare and contrast heap files and sorted files in terms of storage efficiency and query performance. When would you choose to use a heap file over a sorted file, and vice versa? **(3)**

UNIT-I

Q2 a) Design an ER — Diagram for a UNIVERSITY database schema taking into account at least five entities and indicate all keys and cardinality constraints and assumptions that are made. **(7)**

b) Define the following with examples: **(5)**
(i) Super key (ii) Candidate key
(iii) Primary key (iv) Foreign key

c) What do you mean by constraints? Differentiate between table and column constraint. Explain with an example. **(3)**

Q3 a) Consider the following tables: **(8)**
works (Pname, Cname, Salary)
lives (Pname, Street, City)
located-In (Cname, City)
write the following queries in SQL:
i) List the names of the people who work for the company 'Wipro' along with the cities they live in.
ii) Find the names of the persons who do not work for 'Infosys'.
iii) Find the people whose salaries are more than that of all of the 'oracle' employees.
iv) Find the persons who works and lives in the same city.

b) Differentiate between DDL, DML, and DCL in SQL. Provide examples for each category and explain their roles in database management. **(4)**

c) Explain the various inner join operations in relational algebra with examples. **(3)**

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UNIT-II

Q4 a) Describe the five clauses in the syntax of an SQL retrieval query. **(5)**

b) Given the following schema

Emp (Fname, Lname , SSN , bdate , address, gender, salary, superSSN , dno)
dept (dname , dnumber, mgrSSN , megrstartdate)
dept_loc (dnumber, dloc)
project (Pname, Pnumber, Ploc , dnum)
works_on (ESSN, Pno, hours)
dependent (ESSN , dependent_name, gender, bdate, relationship)

Give the relation algebra expression for the following : **(10)**

i) Retrieve the name and address of all employees who work for 'sports' department.
ii) Retrieve each department number, number of employers and their average salary.
iii) List the project number, controlling department number and department manager'slastname, address and birthdate.
iv) Retrieve the name of employees with 2 or more dependents.
v) List female employees from dno = 20 earning more than 50000.

Q5 a) Consider the following company database :

EMP (Name, Ssn , Salary, Superssn, dno)
DEPT (daum, dname, mgrssn)
DEPT_LOC (dnum, dlocation)
PROJECT (Pname, Pnumber, Plocation, dnum)
WORKS _ON (Essn, Pno, Hours)
DEPENDENT (Essn, dept_name, sex)

Write SQL queries for the following: **(8)**

i) Retrieve the names of all employees who work in the department that has the employee with the highest salary among all employees.
ii) Retrieve the names of employees who make at least 10,000 more than the employee who is paid the least in the company.
iii) A view that has the employee's name, supervisor name and employee salary for each employee who works in the 'Research' department.
iv) A view that has the project name, controlling department name, number of employees and total hours worked per week on the project for each project with more than one employee working on it.

b) Consider the following relations for a database that keeps track of student enrollment in courses and the books adopted for each course :

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STUDENT (SSn, Name, Major, bdate)
COURSE (Courseno, Cname, dept)
ENROLL (SSn, Courseno, Quarter, grade)
BOOK_ADOPTION (Courseno, Quarter, book_isbn)
TEXT (book_isbn, book_title, Publisher, Author)

Write the following queries in relational algebra on the database schema:

i) List the number of courses taken by all students named John Smith in winter 2009 (i.e. Quarter = WO9).
ii) Produce a list of textbooks (including courseno. book_isbn, book_title) for courses offered by the 'CS' department that have used more than two books.
iii) List any department that has all its adopted books published by 'Pearson' publishing. **(7)**

UNIT-III

Q6 a) Define Multi valued dependency. Explain 4NF, with an example. Define JOIN dependency. Explain 5NF, with an example. **(7)**

b) Discuss the ACID properties of the database transaction. **(4)**

c) What are the anomalies due to interleaved execution of transactions? Explain with examples. **(4)**

Q7 a) Consider the Universal relation R = {A, B, C, D. &, F, G, H, I, J} and the set of functional dependencies F = {{A, B}—> {C}, {A}—> {D, E}. {B}—> {F}, {F}—> {G, H}, {D}—> {I, J}}.
What is key of R? Decompose R into 2NF and then 3NF relations. **(5)**

b) What is the two-phase locking protocol? How does it Guarantee serializability? **(5)**

c) Illustrate with precedence graph, which of the following schedules is conflict serializable: **(5)**
i) Ri(X); R3(X); Wi(X); Ro(X); W3(X);
ii) R3(X); Ro(X); W3(X); Ri(X); Wi(X);

UNIT-IV

Q8 a) Define B and B+ tree indexes. Discuss their characteristics and compare their suitability for different types of databases. **(8)**

b) What are the key concepts of object-oriented database management systems (OODBMS)? How do they differ from traditional relational database systems? **(7)**

Q9 a) Explain the concept of distributed database management systems (DDBMS). What are the advantages of distributed databases over centralized? **(7)**

b) Compare and contrast multi-level indexes with single-level indexes, discussing their impact on query performance? **(8)**

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END TERM EXAMINATION

FOURTH SEMESTER [B.TECH] JUNE 2024

Paper Code: CIC-212 **Subject: Programming in Java**

Time: 3 Hours **Maximum Marks: 75**

Note: Attempt five questions in all including Q.No.1 which is compulsory. Select one question from each unit.

Q1 Answer the following questions: **(5x3=15)**

a) Discuss any five differences between Interface and Abstract Class.

b) Explain the concept of wrapper classes in Java and discuss their significance?

c) What is remote method invocation? Explain briefly.

d) How to create Inner & Outer Class? How it is helpful for achieving Security.

e) What is the thread's priority? Define the values for different priority in java.

UNIT-I

Q2 a) What is JVM? Explain JVM architecture in detail. **(8)**

b) What is Sandbox security model? How does it help in providing security to resources? Discuss in detail. **(7)**

Q3 a) Explain the security promises of the Java Virtual Machine (JVM) and how it achieves them. **(5)**

b) Write a short note on the following: **(10)**
(i)Various Instructions sets used in Java.
(ii)Garbage Collections
(iii)Class File Format

UNIT-II

Q4 a) Write a Java program demonstrating the implementation of an interface. Define an interface named Shape with methods calculate Area() and calculate Perimeter(). Implement this interface with classes Circle and Rectangle. Test the implementation by creating objects of these classes and invoking the interface methods to calculate their respective areas and perimeters. **(7)**

b) What is exception handling? Create customized exceptions and make use of all the 5 exception keywords used in exception handling. **(8)**

Q5. a) Explain the concept of Applet programming in Java and describe the life cycle of an applet. Provide a Java Applet program illustrating the key stages of an applet's life cycle. **(8)**

b) What is the difference between String Buffer and String Class? Show the use of two methods of String Buffer and String class with the help of example. **(7)**

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UNIT-III

Q6. a) What is thread? Explain the life cycle of a thread with the help of a diagram. What are the various ways to create the thread? Explain to anyone with the help of example. **(8)**

b) What is thread synchronization? When do we use it? Write a program to illustrate the concept of Thread Synchronization method **(7)**

Q7. a) Why is event used in Java? What is the difference between adapter class and listener interface? Explain with the help of an example. **(8)**

b) Discuss various types of layouts used in AWT. Write a program to show the use of Border Layout and Grid Layout with various components. **(7)**

UNIT-IV

Q8. a) Explain different types of JDBC drivers. Write the steps to connect a Java application to a database? Explain with the help of example. **(10)**

b) Write a program to sort the content of a given text file. **(5)**

Q9. a) Write a program to implement the Client -Server Application. **(7)**

b) Write the short note on: **(8)**
(i)What is JNI and how it works?
(ii)What is object serialization vs deserialization?
(iii)What are Java collections? Give some methods of Collection interface.

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