



Cochin University of Science and Technology
Department of Computer Science

Third Semester M.Sc. (Five Year Integrated) in Computer Science (Artificial Intelligence & Data Science)
Second Series Examination - November 2023

21-805-0304: Database Systems

Duration: 2 Hours

Maximum Marks: 20

Answer all questions.

1. Explain different Anomalies that may affect a relational schema, Exemplify, what will be the impact of update anomaly if the table is not Normalized? [4 Marks] [CO3, DL-1, BTL-2]
2. Illustrate functional dependency and Armstrong's Axioms in relational models. Find examples where augmentation and transitivity can be applied? [4 Marks] [CO2, DL-2, BTL-2]
3. Given a relation R (A, B, C, D) and Functional Dependency set FD = {AB → CD, B → C}, Is it in 2NF? If not convert it into 2 NF. [4 Marks] [CO3, DL-3, BTL-3]
4. Explain lossless decomposition and dependency preserving. Consider a relation schema R (X Y Z W P) (above table R) is decomposed into R1(X Y) and R2(Z W). determine whether the above R1 and R2 are Lossless or Lossy? [4 Marks] [CO3, DL-2, BTL-3]
5. Given relational schema Stk_tb (Stk_Id, Stk_name, Price, Stk_Qty,) and Cust_tb(Stk_Id,Trns_qty,Cust_Name)

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Write SQL to display Cust_Name wise sum(Trns_qty) for sum > 2500

Write a SQL join to display Stk_name, Price, Trns_qty, Total_price of all items.

Also Create a trigger for not inserting price less than 100 in Stk_tb

[4 Marks] [CO2, DL-1, BTL-1]

Department of Computer Science,
Cochin University of Science and Technology, Kochi

**M.Sc(Five Year Integrated) Programme in Computer Science
First Internal Examination, October 2023**

22-805-0305 Theory of Computation

Duration: 2 hour

Max Marks: 20

-
- | | |
|--|---------|
| 1. a. What are formal languages? Give example | 2 marks |
| b. What is meant by the power of an alphabet? | 3 marks |
| 2. a. Expressive power of a Push down automata is 2. Why? | 2 marks |
| b. Compare FA, PDA and Turing Machine in terms of its memory. | 3 marks |
| 3. Construct minimal FA for the following languages, alphabet $\Sigma = \{a, b, c\}$ | |
| a. $\{ab, ba\}$ | 5 marks |
| b. $\{a, ab\}$ | |
| 4. Construct FA for the following languages, alphabet $\Sigma = \{a, b\}$ | |
| a. Number of a's in the string is divisible by 3 | 2 marks |
| b. Second symbol from right end of the string is always b. | 3 marks |

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M.Sc

Cochin University of Science and Technology

Department of Computer Science

21-805-0302 Probability and Statistics for
Data Science

I Term, Date: Oct 30, 2023

Timing: 02:00 PM to 04:00 PM

III Semester

Max Marks: 20

Attempt ALL Questions

1. (a) Rajan has to wait for his train to arrive at Aluva station is uniformly distributed between 0 to 40 minutes. (i) What is the probability that Rajan must wait less than 8 minutes? (ii) Draw the probability density function. (3)
- (b) Two fair dice are rolled. Someone tells you that the sum of the two scores is 9. What is the probability distribution of the two dice scores? (2)
2. (a) The PDF of an exponential random variable is given by $f_X(x) = \lambda e^{-\lambda x}$. Find its Cumulative Density Function and Expectation. (3)
- (b) A special dice have three faces with number 1, one face with number 2 and two faces with number 3. Compute the expectation of X if it represents the score on the dice. (2)
3. (a) Toss a fair coin 10 times. Let A is a random variable representing occurrence of "at least one head." Compute P(A). (2)
- (b) Compute the expectation of a binomial random variable. (3)
4. (a) Prove that $\text{Var}(X) = E[X^2] - E[X]^2$ (2)
- (b) Prove that $\text{Var}(X+Y) = \text{Var}(X) + \text{Var}(Y) + 2 \text{Cov}(X,Y)$ (3)

DEPARTMENT OF COMPUTER SCIENCE
Cochin University of Science and Technology
M.Sc. (Five Year Integrated) in Computer Science (AI & DS)
Third Semester
21-805-0303: Mathematics for Machine Learning
First Series Examination, October 2023

Time: 2 hours

Answer All Questions

Maximum Marks: 20

1. Solve the following inconsistent linear system of equations using QR Decomposition:

$$\begin{aligned}x &= 3 \\y + z &= 9 \\x + y &= 7.5 \\z &= 5\end{aligned}$$

[6]

2. Find the pseudoinverse of the following matrix using SVD:

$$A = \begin{bmatrix} 1 & 0 & 0 & 0 & 2 \\ 0 & 0 & 3 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 4 & 0 & 0 & 0 \end{bmatrix}$$

[6]

3. Solve the following system of linear equations using Gauss-Jordan Elimination method:

$$\begin{aligned}x + y + z &= 3 \\2x - y - z &= 3 \\x - y + z &= 9\end{aligned}$$

[4]

4. Find the solution of the following system of equations using the Gauss-Seidel method:

$$\begin{aligned}12x_1 + 3x_2 - 5x_3 &= 1 \\x_1 + 5x_2 + 3x_3 &= 28 \\3x_1 + 7x_2 + 13x_3 &= 76\end{aligned}$$

[4]

Cochin University of Science and Technology
Department of Computer Science



Integrated MSc in Computer Science
(Artificial Intelligence and Data Science)
End Semester Examination - November 2023
21-805-0301:Design & Analysis of Algorithms
(Regulation 2021)
[Regular/Supplementary]

Duration : 3 Hrs

Maximum Marks : 50

Answer all questions. From each question fully answer either (a) or (b)

1. (a) Consider the elements 32, 15, 20, 30, 12, 25, 16. These elements are inserted one by one into an initially empty MaxHeap in the given order. Draw the trees at each step during the insertion process, and determine the final MaxHeap. Analyse the complexity of the insertion process.

[10 marks][CO2, DL-2, BTL-3]

OR

- (b) Explain Master's theorem for divide and conquer recurrences. Solve $T(n) = 6T(n/3) + n^2 \log n$ using Master's theorem.

[10 marks][CO4, DL-2, BTL-3]

2. (a) Write an algorithmic view of the Bellman-Ford algorithm for the shortest path problem. Explain the algorithm using an example and discuss its time complexity.

[10 marks][CO2, DL-2, BTL-3]

OR

- (b) Write an algorithmic overview of Prim's Algorithm, present a proof of the algorithm's correctness, and explain it with the help of an example.

[10 marks][CO3, DL-2, BTL-3]

3. (a) Write the algorithm for QuickSort. Consider the array: [7, 2, 1, 6, 8, 5, 3, 4]. Demonstrate the QuickSort algorithm using this array. Discuss the complexity of the algorithm.

[10 marks][CO4, DL-2, BTL-3]

OR

- (b) Insert the keys 79, 69, 98, 72, 14, 50 into the Hash Table of size 13. Resolve all collisions using Double Hashing where first hash-function is h_1 . $h_1(k) = k \bmod 13$ and second hash-function is h_2 . $h_2(k) = 1 + (k \bmod 11)$.

[10 marks][CO2, DL-2, BTL-3]

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4. (a) Consider a scenario where you have a set of items, each with a weight and a corresponding value. The goal is to maximize the total value of items included in a knapsack, given that the total weight cannot exceed a certain limit. Formulate the problem as a 0-1 Knapsack Problem and apply dynamic programming to find the optimal solution. Discuss the time and space complexity of your dynamic programming solution and provide insights into its efficiency.

OR

- (b) Explain the concepts of dynamic programming, solve the nth Fibonacci number using dynamic programming, and elucidate the complexity difference between the recursive method and dynamic programming.

[10 marks][CO1, DL-2, BTL-2]

[3 marks][CO5, DL-1, BTL-2]

5. (a) (i) Provide 3 examples of NP-complete problems.
(ii) Enumerate advantages associated with NP-completeness.
(iii) Explain the process of transforming a satisfiability decider into a satisfiability optimizer.

[3 marks][CO5, DL-1, BTL-2]

[4 marks][CO5, DL-2, BTL-2]

OR

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- (b) (i) Elaborate on the concept of reduction and its fundamental steps.
(ii) Provide the steps involved in reducing 3-SAT to the clique problem.
(iii) If a polynomial time algorithm capable of accurately determining the largest clique in a given graph is identified, Sketch the Venn diagram depicting the relationships among the complexity classes P, NP, and NP Complete (NPC), and justify the placements in the diagram.

[3 marks][CO5, DL-1, BTL-2]

[3 marks][CO5, DL-1, BTL-2]

[4 marks][CO5, DL-2, BTL-2]



COCHIN UNIVERSITY OF SCIENCE AND TECHNOLOGY
DEPARTMENT OF COMPUTER SCIENCE

Programme: M.Sc. (Five Year Integrated) in Computer Science
(Artificial Intelligence & Data Science)

Course Code & Title: 21-805-0301 Design & Analysis of Algorithms

| | | |
|--------------------------------|-------------------|---|
| Name of Examination: Series II | Max. Marks: 20 | Semester: III |
| Batch: 2022-27 | Duration: 2 Hours | Date: 28.11.2023 Time: 10:00 AM – 12 PM |

Course Outcome

| SI No | Description |
|-------|---|
| CO1 | Understand the basic concepts of design and analysis of fundamental algorithms. |
| CO2 | Develop the ability to design algorithms to attack new problems. |
| CO3 | Prove the correctness of algorithms. |
| CO4 | Develop the ability to analyze the complexity of algorithms. |
| CO5 | Understand Complexity classes, concepts of P and NP problems. |

Answer all questions

1. You are given two sequences of characters, X = "ABCBDAB" and Y = "BDCAB". Find the Longest Common Subsequence (LCS) of X and Y using dynamic programming. (10 marks) [CO2, DL-2, BTL-3]
2. Explain decision problems and optimization problems with examples (2.5 marks) [CO5, DL-2, BTL-2]
3. What is the SAT problem?. Which SAT problems are NP complete? (2.5 marks) [CO5, DL-2, BTL-2]
4. Write down the recurrence relation for the following function and solve it using substitution method. (5 marks) [CO4, DL-2, BTL-2]
Int fun (int n)
{
 If(n<=1)
 return n;
 return fun(n-1)*fun(n-1);
}

— Library Copy — MSc



Cochin University of Science and Technology
Department of Computer Science
**21-805-0302 Probability and Statistics for
Data Science**
II Term, Date: Nov 28, 2023

Timing: 02:00 PM to 04:00 PM

III Semester

Max Marks: 20

Attempt ALL Questions

1. (a) What is a random Process? Give atleast two examples of a random process.
(2 Marks CO2, DL 1, BLT 1)
- (b) What is Poisson Process? Derive probability density function representing a Poisson Process from Binomial Distribution. (3 Marks CO3, DL 2, BLT 1,3)
2. (a) With the help of a suitable example, argue that even though there is dependence between random variables, Law of large numbers holds.
(2 Marks CO3, DL 2, BLT 4)
- (b) Write the form of Gaussian Probability Density Function. What is auto correlation and covariance?
(3 Marks CO2, DL 2, BLT 2)
3. (a) What is the use of (i) Histograms (ii) Box plots and (iii) Scatter plots ? Illustrate with the help of examples. (3 Marks CO4, DL 1, BLT 2)
- (b) What is sampling? Clearly explain sample mean and population mean. Is there any relationship between the two?
(2 Marks CO4, DL 1, BLT 2)
4. (a) Each time a certain horse runs in a three-horse race, he has probability $1/2$ of winning, $1/4$ of coming in second, and $1/4$ of coming in third, independent of the outcome of any previous race. Considering this as a Markov chain, compute the transition matrix after two steps.
(3 Marks CO5, DL 3, BLT 3)
- (b) Illustrate how to compute value of π using Monte-Carlo simulation method.
(2 Marks CO6, DL 2, BLT 3)

Cochin University of Science and Technology, Kochi
Department of Computer Science
M.Sc. (Five Year Integrated) Programme in Computer Science
First Internal Examination, October 2023

21-805-0304: Database Systems

Total Marks: 20

Time: 2 Hours

1. Brief the importance of Primary Key in a table. How to add primary key if you forget to make it while creating table? A table (person_tb) contains a column named person_age. How to prevent values less than 18 and more than 60 in this column? (3 Marks)
2. In a banking application, you faced some problem to login to your account. In which level could be the error? Specify the role of each level in detailed. (3 Marks)
3. Convert the following relational algebra to SQL and SQL to relational algebra (2 Marks)
 - a. $\sigma \text{salary} \geq 50000 \text{ and job} = \text{'Clerk'}$ (Emp)
 - b. select dept_no from employee union select dept_no from dept
 - c. $\prod \text{Student_Name}(\text{RegularClass}) - \prod \text{Student_Name}(\text{ExtraClass})$
 - d. Select loan_type from loan_1 intersect select loan_type from loan_2;
4. Explain the concept and importance of Data Independence in DBMS? Take Banking Database as a specimen, explain how the data independence can be achieved in banking transactions. (4 Marks)
5. What is the relevance of ER Diagram in Databases Design? Construct an ER Diagram for your University Department. Also mark weak entities, multi valued, derived and composite attributes if any (4 Marks)
6. A super market keeps two tables for transactions -Stock_Tb (Item_id, It_name, Qty, Price, Sup_id) and -Sup_tb(Sup_id, Sup_name, Discount%). Write following MYSQL queries (4 using joins or sub query.)
Marks)
 - a. Display the Sup_Name who is not supplying any items?
 - b. Display the Discount% for item 'Coffee'
 - c. Display the sup_name who is supplying highest priced item
 - d. Display Item_name, Price ,Qty for those items having price less than avg(price)

library 10



Cochin University of Science and Technology
Department of Computer Science



First

Third Semester M.Sc. (Five-Year Integrated) in Computer Science
(Artificial Intelligence & Data Science)
Second Series Examination - November 2023
21-805-0303: Mathematics for Machine Learning

Maximum Marks : 20

Duration : 2 Hrs

Answer all questions.

1. Calculate the Hessian matrix at the point $(0,1,\pi)$ for the function

$$f(x,y,z) = e^{-x} \cdot \sin(yz)$$

[4 marks][CO1, DL-2, BTL-3]

2. What are the merits of gradient descent algorithm with momentum? Explain with the help of neat sketches.
[4 marks][CO5, DL-2, BTL-4]

3. Prove that the probability of the critical point being a saddle point is close to 1 if the dimension of the input space is very large.

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[4 marks][CO7, DL-1, BTL-2]

4. Solve the following problem using constrained optimization with Lagrange multiplier.

Max.

$$f(x,y,z) = x^2 + y^2 + z^2$$

subject to

$$x^2 + y^2 = 1$$

$$x + y - z = 1$$

[4 marks][CO6, DL-2, BTL-3]

5. Compute the Jacobian matrix at point (π, π) for

$$f(x,y) = \left(\frac{\cos(x-y)}{x}, e^{x^2-y^2}, x^3 \sin(2y) \right).$$

[4 marks][CO1, DL-2, BTL-3]

DEPARTMENT OF COMPUTER SCIENCE
Cochin University of Science and Technology
M.Sc. (Five Year Integrated) in Computer Science (AI & DS)
End Semester Examination, January 2023
Third Semester

21-805-0303: Mathematics for Machine Learning

Time: 3 hours

Maximum Marks: 50

Module I

1. (a) Solve the following system of linear equations using Gauss elimination method:

$$x - 3z = 2$$

$$2x + 2y + z = 4$$

$$3x + y - 2z = 5$$

- (b) Define affine spaces and affine mapping.

[6]

[4]

OR

2. (a) Find the rank of the following matrix using elimination method:

$$\begin{bmatrix} 1 & -1 & 2 & 1 \\ 1 & 2 & 1 & -2 \\ 1 & 1 & 1 & -1 \end{bmatrix}$$

[6]

- (b) Calculate the determinant of the following matrix using row reduction method:

$$\begin{bmatrix} 2 & 3 & 3 & 1 \\ 0 & 4 & 3 & -3 \\ 2 & -1 & -1 & -3 \\ 0 & -4 & -3 & 2 \end{bmatrix}$$

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[4]

Module II

3. (a) Solve the following system of linear equations using LU decomposition method:

$$x_1 + x_2 + x_3 = 1$$

$$3x_1 + x_2 - 3x_3 = 5$$

$$x_1 - 2x_2 - 5x_3 = 10$$

[6]

- (b) Briefly discuss about the importance of automatic differentiation with the help of an example.

[4]

OR

4. (a) Solve the following system of linear equations using Cholesky decomposition method:

$$6x + 15y + 55z = 76$$

$$15x + 55y + 225z = 295$$

$$55x + 225y + 979z = 1259$$

[6]

- (b) Illustrate the application of QR decomposition in least square approximation.

[4]

Module III

P.T.O.

5. (a) Three persons A , B and C have applied for a job in a private company. The chance of their selections is in the ratio $1 : 2 : 4$. The probabilities that A , B and C can introduce changes to improve the profits of the company are 0.8 , 0.5 and 0.3 , respectively. If the changes does not take place, find the probability that it is due to the appointment of C .
 (b) In a cafe, the customer arrives at a mean rate of 2 per minute. Find the probability of arrival of 5 customers in one minute using Poisson distribution.

OR

6. (a) The speeds of cars are measured using a radar unit, on a motorway. The speeds are normally distributed with a mean of 90km/hr and a standard deviation of 10km/hr . What is the probability that a car selected at chance is moving at more than 100km/hr ?
 (b) An urn contains 9 red, 7 white and 4 black balls. All balls are identical. Two balls are drawn at random from the urn. Find the probability that:
 (i) both are of same colour.
 (ii) both are of not of the same colour.

[6]

[4]

Module IV

7. (a) Maximize (or Minimize)

$$f(x, y, z) = x^2 + y^2 + z^2$$

subject to

$$x^2 + y^2 = 1$$

$$x + y - z = 1$$

using Lagrange multipliers.

- (b) Briefly explain any two gradient descent strategies.

[6]

[4]

OR

8. (a) Illustrate how gradient descent algorithm can be used for parameter estimation with the help of an example.
 (b) Highlight the importance of choosing the right step size in gradient descent algorithm.

[7]

[3]

Module V

9. (a) Consider the following two dimensional patterns
 $(2, 1), (3, 5), (4, 3), (5, 6), (6, 7), (7, 8)$.

Compute the principal component using PCA algorithm.

- (b) Discuss briefly the working principle of SVM algorithm.

[6]

[4]

10. (a) Compare and contrast MLE and EM algorithms.

- (b) The following dataset contains loan information and can be used to try to predict whether a borrower will default. Use the naive Bayes method to determine whether a loan $X =$ (Home Owner = *No*, Marital Status = *Married*, Annual Income = *High*) should be

[3]

Department of Computer Science
Cochin University Of Science And Technology
IIIrd semester M.Sc (Five Year integrated) in Computer Science(AI&DS)
End Semester Examination-Jan-2023
Design Analysis And Algorithm

Time:3hr

Maximum marks:50

(ANSWER ONE FULL QUESTION FROM EACH PART)

PART A

- 1.a)Determine the best case time complexity of merge sort algorithm. (5mark)
b)Apply quick sort on the following list $l=\{4,5,1,7,8,9,2,88\}$. (5mark)
- OR
- 2.a)Write master theorem and explain with suitable example. (5mark)
b)Define main characteristics of algorithm.Discuss time and space complexity (5mark)

PART B

- 3.Write kruskals and prims algorithm to find the minimum cost spanning tree of a given undirected graph with example.Compare their time complexity (10mark)
- OR
- 4.Explain floyd warshall algorithm with an example.which design strategy the algorithm uses? (10mark)

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PART C

- 5.Consider inserting the keys 20,12,31,4,25,28,27,38,69 into a hash table of length $m=11$ using open addressing with the primary hash function $h_1(k)=k \bmod m$.Illustrate the result of inserting keys using double hashing with $h_2(k)=1+(k \bmod (m-1))$ (10mark)
- OR
- 6.Write short notes on any 5 following (10mark)
- | | |
|---------------------------------|---|
| a)Linear probing | b) Randomized quick sort algorithm |
| c)Universal hashing | d)Indicator random variable |
| e)Linearity of expectation | f) Random variables |
| g)Analysis of hashing operation | h)Best ,worst ,and average case complexity. |

PART D

- 7.Discuss the dynamic programming solution to longest common subsequence(LCS) problem with example.Write an algorithm to compute an LCS of two given strings. (10mark)
- OR
- 8.Describe dynamic programming method.Determine dynamic programming recurrence equation for the 0/1 knapsack problem of n instances with example. (10mark)

PART E

9. Discuss the decision problem of class P and NP. Show that the Hamiltonian path problem is NP-complete. (10mark)

OR

(10mark)

10. write a short note on any of two

- a) NP hard and NP complete program
- b) Sat and 2 sat
- c) Vertex cover

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Cochin University of Science and Technology
Department of Computer Science
Third Semester M.Sc. (Five Year Integrated) in Computer Science
(Artificial Intelligence & Data Science)
End Semester Examination – January 2023
21-805-0304 : Database Systems

Duration : 3 hrs Maximum Marks : 50

Answer all questions. From each questions fully attempt either (a) or (b).

1. (a)

- i) Explain Weak entity and Strong entity with examples. (2.5 Marks)
- ii) Explain Characteristics of Database Systems. (2.5 Marks)
- iii) Explain Three Schema Architecture. (5 Marks)

OR

(b)

- i) Explain E-R model with example. (5 Marks)
- ii) Explain Cardinality with examples. (2.5 Marks)
- iii) Explain Participation with examples. (2.5 Marks)

2. (a)

- i) Write a short note on Synthesizing ER diagram into relational Schema. (5 Marks)
- ii) Explain select, project, Cartesian product and Joins in Relational algebra. (5 Marks)

OR

(b)

- i) Explain DDL commands with examples. (5 Marks)
- ii) Explain DML commands with examples. (5 Marks)

3. (a) Explain Normalisation and Functional Dependency (5 Marks)
- i) Explain Equivalent Normal Forms with examples. (5 Marks)
- OR
- (b) Explain Lossless Join and Dependency Preserving Decomposition. (5 Marks)
- ii) Consider relation R (ABCD), functional dependencies are $AB \rightarrow D$, $BC \rightarrow D$, $A \rightarrow C$, $C \rightarrow A$. Find out the highest Normal Form.(Assume all values are atomic) (5 Marks)

4. (a) Explain Declarative properties of transaction. (2.5 Marks)
- i) Explain Transaction States with diagram. (2.5 Marks)
- ii) Explain Serial schedules, Concurrent and Serializable Schedules. (2.5 Marks)
- iii) Explain Locking. (2.5 Marks)
- iv) Explain Locking. OR

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- (b) Explain Concurrency Control. (5 Marks)
- i) Explain Recoverable and Cascadeless Schedules. (5 Marks)
- ii) Explain Deadlock. (5 Marks)
- iii) Explain MongoDB with operations and examples. (5 Marks)
- OR
- (b) Explain Big Data. (2.5 Marks)
- i) Explain Document-Based NOSQL Systems. (2.5 Marks)
- ii) Explain NOSQL Graph Databases and Neo4j. (5 Marks)

DEPARTMENT OF COMPUTER SCIENCE
Cochin University of Science and Technology
M.Sc. (Five Year Integrated) in Computer Science (AI & DS)
End Semester Examination - Make-up Examination, April 2023
Third Semester

21-805-0303: Mathematics for Machine Learning

Maximum Marks: 50

Time: 3 hours

Module I

1. (a) Solve the following system of linear equations using Gauss elimination method:

$$\begin{aligned}x + y + z &= 2 \\x + 2y + 3z &= 5 \\2x + 3y + 4z &= 11\end{aligned}$$

[5]

- (b) Solve the following system of linear equations using Gauss Jordan method:

$$\begin{aligned}2x + 3y - z &= 5 \\3x + 2y + z &= 10 \\x - 5y + 3z &= 0\end{aligned}$$

[5]

OR

2. (a) Find the rank of the following matrix using elimination method:

$$\begin{bmatrix} 1 & 1 & 2 \\ -1 & -2 & 1 \\ 1 & 0 & 5 \end{bmatrix}$$

[5]

- (b) Calculate the determinant of the following matrix using row reduction method:

$$\begin{bmatrix} -4 & 1 & 1 \\ 1 & 2 & 0 \\ -1 & 1 & 1 \end{bmatrix}$$

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Module II

3. (a) Solve the following system of linear equations using LU decomposition method:

$$\begin{aligned}6x_1 + 18x_2 + 3x_3 &= 3 \\2x_1 + 12x_2 + x_3 &= 19 \\4x_1 + 15x_2 + 3x_3 &= 0\end{aligned}$$

- (b) Compare and contrast Jacobian matrix and Hessian matrix.

OR

4. (a) Compute the QR decomposition of the following matrix:

$$\begin{bmatrix} 1 & 2 & 4 \\ 0 & 0 & 5 \\ 0 & 3 & 6 \end{bmatrix}$$

- (b) Explain briefly the concept of Low Rank Matrix approximation.

Module III

P.T.O.