# SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE
## (AUTONOMOUS)

(Approved by AICTE, New Delhi, Affiliated to JNTUK, Kakinada)
**Accredited by NAAC with 'A+' Grade**
Recognised as Scientific and Industrial Research Organisation
**SRKR MARG, CHINA AMIRAM, BHIMAVARAM – 534204 W.G.Dt., A.P., INDIA**

| **Regulation: R23** | |
|---|---|

**COMPUTER SCIENCE & ENGINEERING (Minors)**

**(Applicable for CE, ECE, EEE & ME)**

**COURSE STRUCTURE**
**(With effect from 2023-24 admitted Batch onwards)**

| Course Code | Course Name | Year/ Sem | Cr | L | T | P | C.I.E | S.E.E | Total Marks |
|---|---|---|---|---|---|---|---|---|---|
| B23CSM101 | Advanced Data Structures and Algorithm Analysis/Data Structures and Algorithms | II-II | 3 | 3 | 0 | 0 | 30 | 70 | 100 |
| B23CSM201 | Principles of Database Management Systems | III-I | 3 | 3 | 0 | 0 | 30 | 70 | 100 |
| B23CSM301 | Computer Networks | III-II | 3 | 3 | 0 | 0 | 30 | 70 | 100 |
| B23CSM401 | Software Engineering | IV-I | 3 | 3 | 0 | 0 | 30 | 70 | 100 |
| B23CSM501 | *MOOCS-I | II-II to IV-I | 3 | -- | -- | -- | -- | -- | 100 |
| B23CSM601 | *MOOCS-II | II-II to IV-I | 3 | -- | -- | -- | -- | -- | 100 |
| | | **TOTAL** | **18** | **12** | **0** | **0** | **120** | **280** | **600** |

*Two MOOCS courses of any COMPUTER SCIENCE & ENGINEERING related Program Core Courses from NPTEL/SWAYAM with a minimum duration of12 weeks (3 Credits) courses other than the courses offered need to be takenby prior information to the concern. These courses should be completed between II Year II Semester to IV Year I Semester.

| Course Code | Category | L | T | P | C | C.I.E. | S.E.E. | Exam |
|---|---|---|---|---|---|---|---|---|
| **B23CSM101** | **Minors** | **3** | **--** | **--** | **3** | **30** | **70** | **3 Hrs.** |

**ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS**

(Minors Degree Course in CSE)

**Course Objectives:** The main objectives of the course is to

| | |
|---|---|
| 1. | Provide knowledge on advanced data structures frequently used in Computer Science domain. |
| 2. | Develop skills in algorithm design techniques popularly used. |
| 3. | Understand the use of various data structures in the algorithm design. |
| 4. | Provide knowledge on advanced data structures frequently used in Computer Science domain. |
| 5 | Develop skills in algorithm design techniques popularly used. |

**Course Outcomes:** At the end of the course Students will be able to**,**

| S. No | Outcome | Knowledge Level |
|---|---|---|
| 1. | **Use** advanced data structures to organize data and solve connectivity problems. | K3 |
| 2. | **Analyze** the time complexity of Divide and Conquer based algorithms. | K4 |
| 3. | **Apply** Greedyand Backtracking strategies to solve computational problems. | K3 |
| 4. | **Use** Dynamic programming strategy to solve optimization problems. | K3 |
| 5. | **Determine** solutions for combinatorial optimization problems. | K3 |

**SYLLABUS**

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|---|---|
| **UNIT-I (08 Hrs)** | **Trees**:<br>AVL Trees – Creation, Insertion, Deletion operations,<br>Red-Black Trees – Creation, Insertion, Deletion operations,<br>Heap Trees (Priority Queues) – Min and Max Heaps, Operations and Applications.<br>**Graphs**: Terminology, Representations, Traversals, Connected and Biconnected Components, Eulers circuits. |
| **UNIT-II (10 Hrs)** | **Introduction to Algorithm Analysis:** Space and Time Complexity analysis, Asymptotic Notations.<br>**Divide and Conquer**: The General Method, Quick Sort, Merge Sort, Strassen's matrix multiplication, Convex Hull, Time complexity analysis of divide and conquer algorithms. |
| **UNIT-III (12 Hrs)** | **Greedy Method**: General Method, Job Sequencing with deadlines, Knapsack Problem, Minimum cost spanning trees, Single Source Shortest Paths.<br>**Backtracking**: General Method, 8-Queens Problem, Sum of Subsets problem, Graph Coloring, 0/1 Knapsack Problem. |

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| **UNIT-IV (10 Hrs)** | **Dynamic Programming**: General Method, All pairs shortest paths, Single Source Shortest Paths – General Weights (Bellman Ford Algorithm), Optimal Binary Search Trees, 0/1 Knapsack, String Editing, Traveling Salesperson problem. |
| | |
| **UNIT-V (10 Hrs)** | **Branch and Bound**: The General Method, 0/1 Knapsack Problem, Travelling Salesperson problem.<br>**NP Hard and NP Complete Problems**: Basic Concepts, non-deterministic algorithms, NP - Hard and NP-Complete Class, Cook's Theorem. |
| | |
| **Textbooks:** | |
| 1. | Data Structures and Algorithm Analysis in C, Mark Allen Weiss, 2nd Edition, Pearson Edu Publishers, 2007. |
| 2. | Computer Algorithms/C++ Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran ,2nd Edition University Press,2008. |
| **Reference Books:** | |
| 1. | Fundamentals of Data Structures in C++, Horowitz Ellis, SahniSartaj, Mehta, Dinesh, 2nd Edition, Universities Press, 2008. |
| 2. | Data Structures and Algorithms: Concepts, Techniques and Applications – G.A.V.Pai, 1st Edition TataMc Graw Hill Publishers,2017. |
| 3. | Data Structures and program design in C, Robert Kruse, 2nd Edition, Pearson Education Asia,2006. |
| | |
| **e-Resources** | |
| 1. | https://www.tutorialspoint.com/advanced_data_structures/index.asp |
| 2. | http://peterindia.net/Algorithms.html |
| 3 | https://github.com/GDSC-KIIT/DSA-Resource?stab=readme-ov-file |
| 4 | https://www.geeksforgeeks.org/design-and-analysis-of-algorithms/?ref=lbp |

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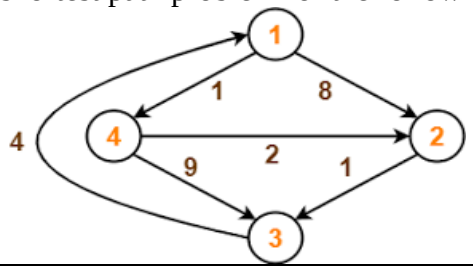
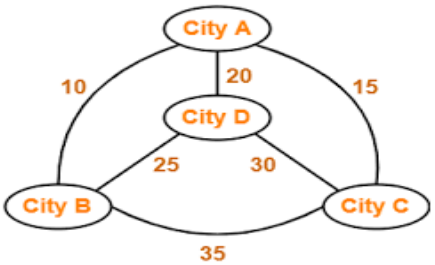
| | | | | | **Course Code: B23CSM101** |
| | | **SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)** | | | **R23** |
| | | **II B.Tech. II Semester MODEL QUESTION PAPER** | | | |
| | | **ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS** | | | |
| | | (Minors Degree Course in CSE) | | | |
| **Time: 3 Hrs.** | | | | | **Max. Marks: 70 M** |
| | | Answer Question No.1 compulsorily | | | |
| | | Answer **ONE Question** from **EACH UNIT** | | | |
| | | Assume suitable data if necessary | | | |
| | | | | | **10 x 2 = 20 Marks** |
| | | | **CO** | **KL** | **M** |
| **1.** | **a).** | What is the balance factor in an AVL tree? | 1 | 2 | 2 |
| | **b).** | List the properties of a Red-Black Tree. | 1 | 2 | 2 |
| | **c).** | Define Time and Space complexity. | 2 | 2 | 2 |
| | **d).** | Explain the General method of divide and conquer | 2 | 2 | 2 |
| | **e).** | Define the Problem of Job-sequencing with deadlines. | 3 | 2 | 2 |
| | **f).** | Discuss the General Method of Backtracking. | 3 | 2 | 2 |
| | **g).** | What is the general method of Dynamic Programming? | 4 | 2 | 2 |
| | **h).** | Define an Optimal Binary Search Tree. | 4 | 2 | 2 |
| | **i).** | What is LCBB Method? | 5 | 2 | 2 |
| | **j).** | Differentiate Deterministic and Non-deterministic algorithms. | 5 | 2 | 2 |
| | | | | | |
| | | | | | **5 x 10 =50Marks** |
| | | **UNIT-1** | | | |
| **2.** | **a).** | Construct an AVL tree from the following sequence of numbers: 30, 20, 10, 5, 25, 40, 50, and 35. | 1 | 3 | 5 |
| | **b).** | Explain about deletion operation of Red-Black Tree. | 1 | 3 | 5 |
| | | **OR** | | | |
| **3.** | **a).** | Explain about Min Heap construction with an example. | 1 | 3 | 5 |
| | **b).** | Explain about representations of Graph with an example. | 1 | 3 | 5 |
| | | | | | |
| | | **UNIT-2** | | | |
| **4.** | **a).** | Discuss the different methods for analyzing an algorithm's performance. | 2 | 3 | 5 |
| | **b).** | Explain about Asymptotic Notations with a neat sketch for each. | 2 | 3 | 5 |
| | | **OR** | | | |
| **5.** | **a).** | Apply the Merge Sort algorithm to sort the following list in ascending order: 23, 45, 78, 12, 5, 34, 89, and 57. | 2 | 3 | 5 |
| | **b).** | Explain Strassen's Matrix Multiplication Algorithm. | 2 | 3 | 5 |
| | | | | | |
| | | **UNIT-3** | | | |
| **6.** | **a).** | Solve the following job sequencing with deadlines using greedy method.n=6,(p1,p2..,p6)=(20,40,5,15,10,8)and(d1,d2...d6)=(5,2,4,3,3,1) | 3 | 3 | 5 |
| | **b).** | Explain Prim's Algorithm for finding the Minimum Spanning Tree (MST) of an example graph. | 3 | 3 | 5 |
| | | **OR** | | | |
| **7.** | **a).** | Explain 4-Queen's Problem using Backtracking. | 3 | 3 | 5 |
| | **b).** | Solve 0/1 knapsack problem for the following data using Backtracking. n=5 ,(p1, p2, p3, p4, p5,) = (7,8,9,11,12) ,(w1, w2, w3, w4, w5) = | 3 | 3 | 5 |

| | | | | | |
|---|---|---|---|---|---|
| | | (13,15,16,23,24) with knapsack capacity, m=26. | | | |
| | | | | | |
| | | **UNIT-4** | | | |
| **8.** | **a).** | Solve the all pairs shortest path problem for the following Graph:<br>  <br> | 4 | 3 | 10 |
| | | **OR** | | | |
| **9.** | **a).** | Explain Travelling Salesman Problem for the following Graph using Dynamic Programming<br>  <br> | 4 | 3 | 10 |
| | | | | | |
| | | **UNIT-5** | | | |
| **10.** | **a).** | Explain about 0/1 Knapsack Problem using LC Branch and Bound with the given instance. Consider the instance: M=15, n=4, (P1,P2,P3,P4) = ((10,10,12,18) and (w1,w2,w3,w4) = (2,4,6,9). | 5 | 3 | 10 |
| | | **OR** | | | |
| **11.** | **a).** | Draw the portion of the State Space Tree generated by LCBB for the instance: n=5, m=12, (p1…p5) = (10,15,6,8,4), w1….w5) = (4,6,3,4,2). | 5 | 3 | 5 |
| | **b).** | Explain Classes NP-hard and NP-complete | 5 | 3 | 5 |

**CO-COURSE OUTCOME** **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE : Questions can be given as A,B splits or as a single Question for 10 marks

| Course Code | Category | L | T | P | C | C.I.E. | S.E.E. | Exam |
|---|---|---|---|---|---|---|---|---|
| B23CSM101 | Minors | 3 | -- | -- | 3 | 30 | 70 | 3 Hrs. |

**DATA STRUCTURES AND ALGORITHMS**

(Minors Degree Course in CSE)

**Course Objectives:** The main objectives of the course is to

| | |
|---|---|
| 1. | Introduce the fundamental concept of data structures and abstract data types. |
| 2. | Provide a comprehensive understanding of fundamental data structures, including arrays, linked structures, stacks, queues, trees, and graphs. |
| 3. | Understand the use of various data structures in the algorithm design. |

**Course Outcomes:** At the end of the course students will be able to

| S.No | Outcome | Knowledge Level |
|---|---|---|
| 1. | **Describe** the role of data structures in organizing and accessing data efficiently in algorithms. | K2 |
| 2. | **Implement** stacks and queues and apply them to solve different Computer Science and Engineering problems. | K3 |
| 3. | **Implement** linked list operations to enhance data organization and accessibility. | K3 |
| 4. | **Use** Nonlinear data structures to solve problems related to data organization and network connectivity. | K3 |
| 5. | **Apply** algorithm design techniques to solve real-world problems in areas such as graph theory and optimization. | K3 |



**SYLLABUS**

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|---|---|
| **UNIT-I (10 Hrs)** | **Introduction to Data Structures:** Definition and importance of data structures, Abstract data types (ADTs) and their implementation. Performance Analysis, time complexity analysis of basic searching and sorting algorithms.<br>**Introduction to Recursion:** Towers of Hanoi, Quick Sort, Merge Sort. |
| **UNIT-II (10 Hrs)** | **Stacks:** Stack ADT, implementing stack using arrays, Applications of stacks: Infix to Postfix Conversion, Evaluating Postfix Expressions.<br>**Queues:** Queue ADT, implementing queue using arrays, Operations of Circular Queues. Linked stack and Linked queue. |
| **UNIT-III (10 Hrs)** | **Linked Lists:** Singly linked lists: Representation and operations, Doubly linked lists: Representation and operations, Circular linked lists: Representation and operations, comparing arrays and linked lists. Applications of Linked Lists: Representing Polynomials as Singly Linked Lists, Addition and Multiplication of Polynomials. |

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| **UNIT-IV (10 Hrs)** | **Trees:** Representation of Trees, Binary Trees Abstract Data Type, Binary Tree Representations and Traversals, Representation and operations of Binary Search Trees, Operations of Max heap, Heap sort.<br>**Graphs:** Graph Abstract Data Type, Definitions, Graph Representations, Elementary Graph Operations, Depth First Search, Breadth First Search, Single Source Shortest path: Dijkstra's Algorithm. |
| | |
| **UNIT-V (10 Hrs)** | **Algorithm Design Techniques:** Greedy Algorithms: Minimum Cost Spanning Trees, Prim's and Kruskal's Algorithms, Divide and Conquer: The selection problem, Dynamic Programming: All Pairs Shortest Path, Branch and Bound: Travelling Salesman Problem, Back Tracking Algorithms: DFS Graph Traversal. |
| | |
| **Textbooks:** | |
| 1. | Fundamentals of Data Structures in C, 2nd Edition, Horowitz, Sahni, Universities Press. |
| 2. | Data Structures and Algorithm Analysis in C, Mark Allen Weiss, 2nd Edition, Pearson Edu Publishers, 2007. |
| **Reference Books:** | |
| 1. | Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and Peter Sander |
| 2. | C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E. Hopcroft |
| 3. | Problem Solving with Algorithms and Data Structures" by Brad Miller and David Ranum |
| 4. | Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein |
| 5. | Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching, and Graph Algorithms" by Robert Sedgewick |
| | |
| **e-Resources** | |
| 1. | https://nptel.ac.in/courses/106102064 |

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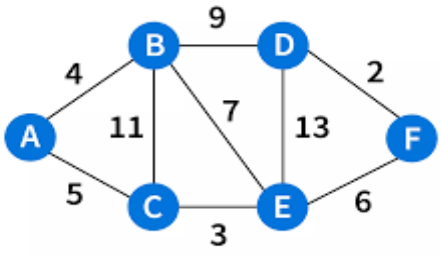
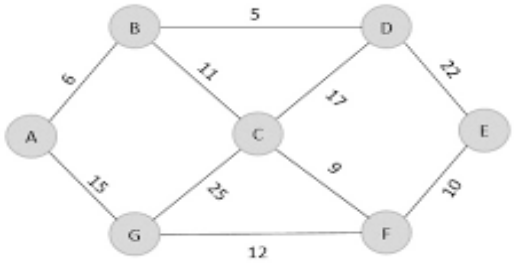
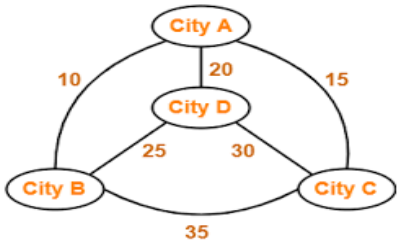
| | | | | | **Course Code: B23CSM101** |
| | | **SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)** | | | **R23** |
| | | **II B.Tech. II Semester MODEL QUESTION PAPER** | | | |
| | | **DATA STRUCTURES AND ALGORITHMS** | | | |
| | | (Minors Degree Course in CSE) | | | |
| **Time: 3 Hrs.** | | | | | **Max. Marks: 70 M** |
| | | Answer Question No.1 compulsorily | | | |
| | | Answer **ONE Question** from **EACH UNIT** | | | |
| | | Assume suitable data if necessary | | | |
| | | | | | **10 x 2 = 20 Marks** |
| | | | **CO** | **KL** | **M** |
| **1.** | **a).** | Explain about Linear Data structures. | 1 | 2 | 2 |
| | **b).** | Define Towers of Hanoi Problem. | 1 | 2 | 2 |
| | **c).** | Write various operations of stacks. | 2 | 2 | 2 |
| | **d).** | Describe Queue ADT | 2 | 2 | 2 |
| | **e).** | List out different operations on Singly Linked List. | 3 | 2 | 2 |
| | **f).** | Draw the structure of the Doubly Linked List. | 3 | 2 | 2 |
| | **g).** | Write any four properties of Tree Data Structure. | 4 | 2 | 2 |
| | **h).** | Explain different Graph representations. | 4 | 2 | 2 |
| | **i).** | Explain General method of Divide-and-Conquer. | 5 | 2 | 2 |
| | **j).** | Define Travelling Salesperson Problem. | 5 | 2 | 2 |
| | | | | | |
| | | **5 x 10 =50Marks** | | | |
| | | **UNIT-1** | | | |
| **2.** | **a).** | What is meant by time complexity? How do we analyze the time complexity of an algorithm? | 1 | 2 | 5 |
| | **b).** | Explain step by step procedure to sort the following list in ascending order: 10, 6, 3, 7, 17, 26, 56, 32, 72, 2, 23, 5, and 77. Using quick sort. | 1 | 2 | 5 |
| | | **OR** | | | |
| **3.** | **a).** | Write a recursive algorithm for Binary search and search the element 87 in the list 2, 5, 6, 12, 23, 33, 44, 54, 65. | 1 | 2 | 5 |
| | **b).** | Explain the process of Merge Sort Technique with the help of suitable example. | 1 | 2 | 5 |
| | | | | | |
| | | **UNIT-2** | | | |
| **4.** | **a).** | Develop primitive operation functions that performed on Stack using array. | 2 | 3 | 5 |
| | **b).** | Write algorithms for different operations of Circular Queues. | 2 | 3 | 5 |
| | | **OR** | | | |
| **5.** | **a).** | Convert the following expression from infix to postfix using stack.<br>a / b + (c – d) * e | 2 | 3 | 5 |
| | **b).** | Write a program to implement queue using array. | 2 | 3 | 5 |
| | | | | | |
| | | **UNIT-3** | | | |
| **6.** | **a).** | Explain about deletion operation(s) on Single Linked List | 3 | 3 | 5 |
| | **b).** | Write the function(s) for insertion operations on Double Linked List | 3 | 3 | 5 |
| | | **OR** | | | |
| **7.** | **a).** | Explain polynomial representation using linked list with an example | 3 | 3 | 5 |

| | | | | | |
|---|---|---|---|---|---|
| | **b).** | Develop an algorithm to insert an element at end in circular linked list | 3 | 3 | 5 |
| | | | | | |
| | | **UNIT-4** | | | |
| **8.** | **a).** | Build a BST for the following list of elements 54,84,26,39,98, 62,9,18, 42,53,64,73,68,71,65, and perform tree traversals for above list | 4 | 3 | 5 |
| | **b).** | Find the shortest path from A to F using Dijkstra's algorithm   | 4 | 3 | 5 |
| | | **OR** | | | |
| **9.** | **a).** | Explain about insertion and deletion operations on MAX HEAP with suitable examples. | 4 | 3 | 5 |
| | **b).** | Explain how DFS works with the help of an example graph. Illustrate the order in which nodes are visited during the traversal. | 4 | 3 | 5 |
| | | | | | |
| | | **UNIT-5** | | | |
| **10.** | **a).** | Explain Prim's Algorithm for finding the Minimum Spanning Tree (MST) of an example graph. | 5 | 3 | 5 |
| | **b).** | Explain the Selection problem with the help of suitable example. | 5 | 3 | 5 |
| | | **OR** | | | |
| **11.** | **a).** | Find the Minimum Spanning for the following graph using Kruskal's algorithm.   | 5 | 3 | 5 |
| | **b).** | Explain about Travelling Salesman Problem for the following Graph using Branch and Bound   | 5 | 3 | 5 |

**CO-COURSE OUTCOME** **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE : Questions can be given as A,B splits or as a single Question for 10 marks

| Course Code | Category | L | T | P | C | C.I.E. | S.E.E. | Exam |
|---|---|---|---|---|---|---|---|---|
| B23CSM201 | Minors | 3 | -- | -- | 3 | 30 | 70 | 3 Hrs. |

**PRINCIPLES OF DATABASE MANAGEMENT SYSTEMS**

(Minors Degree Course in CSE)

**Course Objectives:** The main objectives of the course is to

| | |
|---|---|
| 1. | Introduce database management systems |
| 2. | Analyze database through systematic database design approaches |
| 3. | Use SQL as a universal Database language |
| 4. | Demonstrate normalization |
| 5. | Explain transaction management techniques |

**Course Outcomes:** At the end of the course Students will be able to**,**

| S.No | Outcome | Knowledge Level |
|---|---|---|
| 1. | **Describe** database management systems fundamental concepts | K2 |
| 2. | **Analyze** databases using Conceptual and Logical database design | K4 |
| 3. | **Apply** SQL to Create, maintain and manipulate a relational database | K3 |
| 4. | **Apply** normalization for refining database schema | K3 |
| 5. | **Illustrate** Transaction management techniques. | K2 |

**SYLLABUS**

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|---|---|
| **UNIT-I (08 Hrs)** | **Introduction:** Databases and Database Management Systems, Characteristics of DBMS, DBMS Vs File System, Database Users, Database applications. Brief introduction of different Data Models, Introduction to Relational Database Management Systems, Concepts of Schema, Instance, three tier schema architecture for data independence, Database system structure, Centralized and Client Server architecture for the database. |
| **UNIT-II (10 Hrs)** | **Relational Model:** Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance, Relational Algebra (select and project). Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, extended features of ER model. |
| **UNIT-III (12 Hrs)** | **SQL:** Simple Database schema, data types, table definitions (create, alter), Creating tables with relationship, implementation of key and integrity constraints, different DML operations (insert, delete, update), Basic SQL querying (select and project) using where clause, nested queries, sub queries, grouping, aggregation, ordering, relational set operations, implementation of different types of joins, view (updatable and non- updatable). |

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|---|---|
| **UNIT-IV (10 Hrs)** | **Schema Refinement (Normalization):** Purpose of Normalization or schema refinement, concept of functional dependency, closure of functional dependencies, normal forms based on functional dependencies, 1NF, 2NF and 3 NF, Boyce-Codd normal form (BCNF), Lossless join and dependency preserving decomposition. |
| | |
| **UNIT-V (10 Hrs)** | **Transaction Concept:** Transaction State, ACID properties, Concurrent Execution of transactions, Schedules, Serializability, Recoverability, Testing for Serializability, Lock based and timestamp-based concurrency protocols, Implementation of Isolation, Failure Classification, ARIES Recovery algorithm. |
| | |
| **Textbooks:** | |
| 1. | Abraham Silberschatz, Henry F. Korth and S. Sudarshan (Author), Database System Concepts, 7th Edition, TMH, 2021. |
| 2. | Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems, 3rd Edition, Pearson, 2014 |
| **Reference Books:** | |
| 1. | C.J. Date, A. Kannan and S. Swamy Nathan, An Introduction to Database Systems, 8th Edition, Pearson, 2006. |
| 2. | Elmasri Ramez and Navathe Shamkant, Fundamentals of Database System, 7th Edition, Pearson, 2017. |
| 3. | Corlos Coronel, Steven Morris, Peter Robb, Database Principles Fundamentals of Design Implementation and Management, CBS publishers and Distributors, 2014. |
| | |
| **e-Resources** | |
| 1. | https://nptel.ac.in/courses/106/105/106105175/ |
| 2. | https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01288046454761881634 7_shared/overview |

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| | | | | | **Course Code: B23CSM201** |
| | | **SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)** | | | **R23** |
| | | **III B.Tech. I Semester MODEL QUESTION PAPER** | | | |
| | | **PRINCIPLES OF DATABASE MANAGEMENT SYSTEMS** | | | |
| | | (Minors Degree Course in CSE) | | | |
| **Time: 3 Hrs.** | | | | | **Max. Marks: 70 M** |
| | | Answer Question No.1 compulsorily | | | |
| | | Answer **ONE Question** from **EACH UNIT** | | | |
| | | Assume suitable data if necessary | | | |
| | | | | | **10 x 2 = 20 Marks** |
| | | | **CO** | **KL** | **M** |
| **1.** | **a).** | What are the goals of DBMS? | 1 | 1 | 2 |
| | **b).** | What is Data Independence? List the types. | 1 | 1 | 2 |
| | **c).** | Quote the example for composite attribute. | 2 | 1 | 2 |
| | **d).** | What is meant by cardinality and degree of relation? | 2 | 1 | 2 |
| | **e).** | Explain the difference between drop and delete commands? | 3 | 1 | 2 |
| | **f).** | Explain the left outer join? | 3 | 1 | 2 |
| | **g).** | State 1NF with example? | 4 | 1 | 2 |
| | **h).** | Define dependency preserving decomposition? | 4 | 1 | 2 |
| | **i).** | What is conflict serializability? | 5 | 1 | 2 |
| | **j).** | Mention any two failure classifications? | 5 | 1 | 2 |
| | | | | | |
| | | | | | **5 x 10 = 50 Marks** |
| | | **UNIT-1** | | | |
| **2.** | **a)** | Compare Database Management Systems with File Processing Systems | 1 | 3 | 4 |
| | **b)** | Explain the roles of different database users | 1 | 2 | 6 |
| | | **OR** | | | |
| **3.** | **a)** | Discuss the applications of Database Management Systems | 1 | 2 | 5 |
| | **b)** | Describe the structure of a Database Management System | 1 | 2 | 5 |
| | | | | | |
| | | **UNIT-2** | | | |
| **4.** | | Give syntax and apply the SQL commands for defining two example tables of your choice. Then insert data, update data in the tables | 2 | 3 | 10 |
| | | **OR** | | | |
| **5.** | | What are relational instances and schemas? How'd you use keys and schemas in relational model? | 2 | 3 | 10 |
| | | | | | |
| | | **UNIT-3** | | | |
| **6.** | **a)** | Define and differentiate between Domain, Key, and Integrity constraints. | 3 | 3 | 5 |
| | **b)** | Illustrate the SELECT and PROJECT operations in Relational Algebra | 3 | 3 | 5 |
| | | **OR** | | | |
| **7.** | **a)** | Describe any two extended features of the ER model | 2 | 3 | 5 |
| | **b)** | What are the different types of relationships in ER models? | 2 | 3 | 5 |
| | | | | | |
| | | **UNIT-4** | | | |

| | | | | | |
|---|---|---|---|---|---|
| **8.** | **a)** | Apply Loss-less join decomposition into BCNF for an example table | 4 | 3 | 5 |
| | **b)** | Apply dependency preserving decomposition into 3NFfor an example table | 4 | 3 | 5 |
| | | **OR** | | | |
| **9.** | | Illustrate Normal forms from 1 NF to BCNF with suitable examples. | 4 | 3 | 10 |
| | | | | | |
| | | **UNIT-5** | | | |
| **10.** | **a)** | Briefly discuss ARIES algorithm. | 5 | 2 | 5 |
| | **b)** | What is a Transaction? Explain about transaction states? | 5 | 2 | 5 |
| | | **OR** | | | |
| **11.** | **a)** | What is the locking protocol? Describe the Strict Two Phase locking protocol? | 5 | 2 | 5 |
| | **b)** | Explain in detail about ACID properties with examples? | 5 | 2 | 5 |

**CO-COURSE OUTCOME** **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE : Questions can be given as A,B splits or as a single Question for 10 marks

| Course Code | Category | L | T | P | C | C.I.E. | S.E.E. | Exam |
|---|---|---|---|---|---|---|---|---|
| **B23CSM301** | **Minors** | **3** | **--** | **--** | **3** | **30** | **70** | **3 Hrs.** |

**COMPUTER NETWORKS**

(Minors Degree Course in CSE)

**Course Objectives:** The main objectives of the course is to

| | |
|---|---|
| 1. | To understanding the principles of computer networks. |
| 2. | To familiarize with Reference model OSI and TCP/IP |
| 3. | To explore Datalink, Transport and Network layer protocols |
| 4. | To study application layer applications |

**Course Outcomes:** At the end of the course students will be able to

| S.No | Outcome | Knowledge Level |
|---|---|---|
| 1. | **Illustrate** the OSI reference model, TCP/IP, and Digital transmission techniques | K2 |
| 2. | **Apply** error detection and correction, flow control with respect to data link layer | K3 |
| 3. | **Summarize** MAC layer protocols and LAN technologies | K2 |
| 4. | **Demonstrate** various network layer services and Routing algorithms | K3 |
| 5. | **Explain** Transport layer and application layer protocols | K2 |

**SYLLABUS**

| | |
|---|---|
| **UNIT-I (10 Hrs.)** | **Introduction:** Types of Computer Networks, Network Topologies Reference Models- The OSI Reference Model, The TCP/IP Reference Model, A Comparison of the OSI and TCP/IP Reference Models.<br>**Physical Layer**: Introduction to physical layer, Guided Media- Twisted-pair cable, Coaxial cable and Fiber optic cable and unguided media |
| **UNIT-II (10 Hrs.)** | **The Data Link Layer:** Data Link Layer Design Issues, Services Provided to the Network Layer, Error detecting and Error Correcting codes, Elementary Data Link Protocols, Sliding Window Protocols, HDLC. Multiple Access Protocols in Wired Lans, Ethernet, Fast Ethernet, Gigabit Ethernet |
| **UNIT-III (10 Hrs.)** | **The Network Layer**: Network Layer Design Issues, Routing Algorithms, Congestion, Congestion control algorithms. The Network Layer in the Internet, The IP Version 4 Protocol, IP Addresses- Classful, CIDR, NAT, IP Version 6 Protocol, Transition from IPV4 to IPV6 |
| **UNIT-IV (10 Hrs.)** | **The Transport Layer:** The Transport Layer Services, Connection Establishment and Termination, Congestion Control, Sliding Window Protocol, Transport Layer Protocols: UDP, TCP and SCTP |
| **UNIT-V (10 Hrs.)** | **The Application Layer: S**ervices And Protocols, The World Wide Web, HTTP, Domain Name Space, Remote Loging, Electronic Mail and File Transfer**.** |

| | |
|---|---|
| | |
| **Textbooks:** | |
| 1. | "Computer Networks", Andrew S Tanenbaum, David J Wetherall, 5th Edition, Pearson |
| 2. | "Data Communications and Networking", Behrouz A Forouzan, 4th Edition, Tata McGraw Hill Education |
| **Reference Books:** | |
| 1. | "Data and Computer Communication", William Stallings, Pearson |
| 2. | "TCP/IP Protocol Suite", Behrouz Forouzan, McGraw Hill. |
| | |
| **e-Resources** | |
| 1. | https://nptel.ac.in/courses/106105183 |

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|---|---|---|---|---|---|
| | | | | | **Course Code: B23CSM301** |
| | | **SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)** | | | **R23** |
| | | **III B.Tech. II Semester MODEL QUESTION PAPER** | | | |
| | | **COMPUTER NETWORKS** | | | |
| | | (Minors Degree Course in CSE) | | | |
| **Time: 3 Hrs.** | | | | | **Max. Marks: 70 M** |
| | | Answer Question No.1 compulsorily | | | |
| | | Answer **ONE Question** from **EACH UNIT** | | | |
| | | Assume suitable data if necessary | | | |
| | | | | | **10 x 2 = 20 Marks** |
| | | | **CO** | **KL** | **M** |
| **1.** | **a).** | List any two network topologies | 1 | 2 | 1 |
| | **b).** | Define a Local-Area Network | 1 | 2 | 1 |
| | **c).** | State the minimum Ethernet frame size (in bytes | 2 | 2 | 1 |
| | **d).** | What is bit stuffing? | 2 | 2 | 1 |
| | **e).** | Expand ICMP and ARP | 3 | 2 | 1 |
| | **f).** | What is the default subnet mask of a Class A network? | 3 | 2 | 1 |
| | **g).** | Which transport-layer protocol provides flow control? | 4 | 2 | 1 |
| | **h).** | Name any one field in a UDP header | 4 | 2 | 1 |
| | **i).** | State the default port number of HTTPS | 5 | 2 | 1 |
| | **j).** | Mention any two e-mail retrieval protocols | 5 | 2 | 1 |
| | | | | | |
| | | | | | **5 x 10 = 50 Marks** |
| | | **UNIT-1** | | | |
| **2.** | **a).** | Compare guided and unguided transmission media with neat sketches and examples. | 1 | 3 | 10 |
| | | **OR** | | | |
| **3.** | **a).** | Define and differentiate LAN, MAN, WAN. | 1 | 2 | 5 |
| | **b).** | Explain star, bus, ring topologies with their advantages and disadvantages. | 1 | 3 | 5 |
| | | | | | |
| | | **UNIT-2** | | | |
| **4.** | **a).** | Distinguish between Go-back-N and Selective-Repeat ARQ protocols. | 2 | 3 | 5 |
| | **b).** | A 12-bit dataword 110100110011 is to be sent using CRC generator polynomial $G(x)=x^4+x+1$. Find the transmitted frame. | 2 | 3 | 5 |
| | | **OR** | | | |
| **5.** | **a).** | Explain p-persistent CSMA and its performance. | 2 | 3 | 5 |
| | **b).** | An 11-bit Hamming code 10111011010 is received. Detect and correct the error (if any) and retrieve the original 7-bit data. | 2 | 3 | 5 |
| | | | | | |
| | | **UNIT-3** | | | |

| | | | | | |
|---|---|---|---|---|---|
| **6.** | **a).** | A Class C network 192.168.1.0 must be split into 6 sub-nets.<br>(i) Find the new subnet mask (dotted & CIDR).<br>(ii) Hosts per subnet.<br>(iii) First & last valid host of subnet 3. | 3 | 3 | 5 |
| | **b).** | Describe the leaky-bucket and token-bucket congestion control algorithms. | 3 | 2 | 5 |
| | | **OR** | | | |
| **7.** | **a).** | Explain the differences between distance-vector and link-state routing, detailing their update mechanisms. | 3 | 3 | 10 |
| | | | | | |
| | | **UNIT-4** | | | |
| **8.** | **a).** | Draw the TCP segment format and explain each field. | 4 | 3 | 5 |
| | **b).** | Discuss slow-start and congestion-avoidance phases in TCP with a congestion window diagram. | 4 | 3 | 5 |
| | | **OR** | | | |
| **9.** | **a).** | Compare features of SCTP with TCP. | 4 | 3 | 5 |
| | **b).** | Demonstrate connection termination in TCP using a timing diagram. | 4 | 2 | 5 |
| | | | | | |
| | | **UNIT-5** | | | |
| **10.** | **a).** | Explain SMTP in detail. Give its uses, state strengths and weaknesses | 5 | 2 | 5 |
| | **b).** | Differentiate persistent and non-persistent HTTP connections with timing diagrams. | 5 | 2 | 5 |
| | | **OR** | | | |
| **11.** | **a).** | Explain in detail about DNS and its frame format. | 5 | 2 | 5 |
| | **b).** | Explain FTP architecture highlighting control & data connections. | 5 | 2 | 5 |

**CO-COURSE OUTCOME** **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE : Questions can be given as A,B splits or as a single Question for 10 marks

| Course Code | Category | L | T | P | C | C.I.E. | S.E.E. | Exam |
|---|---|---|---|---|---|---|---|---|
| **B23CSM401** | **Minors** | **3** | **--** | **--** | **3** | **30** | **70** | **3 Hrs.** |

**SOFTWARE ENGINEERING**

(Minors Degree Course in CSE)

**Course Objectives:** The main objectives of the course is to

| | |
|---|---|
| 1. | Give exposure to phases of software development and common process models. |
| 2. | Give exposure to a variety of software engineering practices such as requirements analysis and specification |
| 3. | Give exposure to software planning strategies |
| 4. | Give exposure to software design techniques |
| 5. | Give exposure to various software testing methods and strategies |

**Course Outcomes:** At the end of the course Students will be able to**,**

| S.No | Outcome | Knowledge Level |
|---|---|---|
| 1. | **Demonstrate** the key concepts of software engineering and software development process models in real-world scenarios. | K3 |
| 2. | **Determine** techniques to gather, differentiate, and document functional and non-functional software requirements. | K3 |
| 3. | **Determine** a software project through effort estimation, task scheduling, resource allocation, and quality, risk, and monitoring planning. | K3 |
| 4. | **Apply** software design principles and design patterns to address specific software design challenges. | K3 |
| 5. | **Use** testing techniques to ensure software quality and reliability during the software implementation process. | K3 |

**SYLLABUS**

| | |
|---|---|
| **UNIT-I (10Hrs)** | The software problem, Process and Project, Component Software Process, Software Development Process Models, Project Management Process |
| **UNIT-II (10 Hrs)** | **Software Requirements Analysis and Specification:** Value of a Good SRS, Requirement Process, Requirement Process, Requirement Specification, Functional specification with use cases, other approaches for analysis, validation |
| **UNIT-III (10 Hrs)** | **Planning a software project:** Effort estimation, project schedule and staffing, quality planning, risk management planning, project monitoring plan, detailed scheduling |
| **UNIT-IV (10 Hrs)** | **Software architecture**: Role of software architecture, architecture views, component and connector view, architecture styles for C&C view, documenting architecture design |

| | |
|---|---|
| | **Design**: design concepts, function-oriented design, object-oriented design, detailed design, verification, metrics |
| | |
| **UNIT-V (10 Hrs)** | **Coding and unit testing**: Programming principles and guidelines, incrementally developing code, managing evolving code, unit testing, code inspection, metrics.<br>**Testing:** Testing concepts, testing process, Black-box testing, White-box testing, metrics |
| | |
| **Textbooks:** | |
| 1. | Software Engineering a Practitioner's Approach, Roger S. Pressman, 9th Edition, Mc-Graw Hill International Edition. |
| 2. | A Concise Introduction to Software Engineering, Pankaj Jalote, Springer, 2008 |
| **Reference Books:** | |
| 1. | Software Engineering, Ian Sommerville,10th Edition, Pearson. |
| 2. | Fundamentals of Software Engineering, Rajib Mall, 5th Edition, PHI |
| | |
| **e-Resources** | |
| 1. | https://onlinecourses.swayam2.ac.in/cec20_cs07/preview |

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|---|---|---|---|---|---|
| | | | | | **Course Code: B23CSM401** |
| | | **SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)** | | | **R23** |
| | | **IV B.Tech. I Semester MODEL QUESTION PAPER** | | | |
| | | **SOFTWARE ENGINEERING** | | | |
| | | (Minors Degree Course in CSE) | | | |
| **Time: 3 Hrs.** | | | | | **Max. Marks: 70 M** |
| | | Answer Question No.1 compulsorily | | | |
| | | Answer **ONE Question** from **EACH UNIT** | | | |
| | | Assume suitable data if necessary | | | |
| | | | | | **10 x 2 = 20 Marks** |
| | | | **CO** | **KL** | **M** |
| **1.** | **a).** | What is meant by the "software problem" in software engineering? | 1 | 1 | 2 |
| | **b).** | Distinguish between a software process and a software project. | 1 | 2 | 2 |
| | **c).** | State one benefit of validating software requirements early in the requirement process. | 2 | 1 | 2 |
| | **d).** | Differentiate functional and non-functional requirements | 2 | 2 | 2 |
| | **e).** | What is risk management? | 3 | 1 | 2 |
| | **f).** | Name two components typically included in a software project schedule. | 3 | 1 | 2 |
| | **g).** | List two key concepts in software design. | 4 | 1 | 2 |
| | **h).** | What is the main role of software architecture in software engineering? | 4 | 1 | 2 |
| | **i).** | Why is code readability important? | 5 | 2 | 2 |
| | **j).** | What is the purpose of unit testing in software development? | 5 | 1 | 2 |
| | | | | | |
| | | | | | **5 x 10 = 50 Marks** |
| | | **UNIT-1** | | | |
| **2.** | | Compare the waterfall model with the iterative model in terms of their approach to handling software development phases | 1 | 2 | 10 |
| | | **OR** | | | |
| **3.** | | Discuss the main activities included in software project management process. | 1 | 2 | 10 |
| | | | | | |
| | | **UNIT-2** | | | |
| **4.** | | In what ways do use cases enhance the process of analyzing and specifying functional requirements during requirement analysis? | 2 | 2 | 10 |
| | | **OR** | | | |
| **5.** | | Describe the process of writing a good SRS. What best practices should be followed to ensure clarity, measurability, and testability? | 2 | 2 | 10 |
| | | | | | |
| | | **UNIT-3** | | | |
| **6.** | | Briefly describe the steps involved in developing a project monitoring plan for a software project | 3 | 2 | 10 |
| | | **OR** | | | |
| **7.** | | Explain the process of effort estimation for a software project and discuss its impact on project staffing decisions | 3 | 2 | 10 |
| | | | | | |
| | | **UNIT-4** | | | |
| **8.** | **a).** | Describe the component and connector view, and provide an example | 4 | 2 | 5 |

| | | | | | |
|---|---|---|---|---|---|
| | | of how it represents system structure | | | |
| | **b).** | Why is verification important during detailed design, and what metrics might be used to support it? | 4 | 2 | 5 |
| | | | | | |
| | | **OR** | | | |
| **9.** | **a).** | Compare function-oriented design and object-oriented design in terms of their approach to software development. | 4 | 2 | 5 |
| | **b).** | Illustrate how documenting architecture design contributes to a software system's maintainability and scalability | 4 | 2 | 5 |
| | | | | | |
| | | **UNIT-5** | | | |
| **10.** | **a).** | What is code inspection? Outline three key elements typically examined during a code inspection | 5 | 2 | 5 |
| | **b).** | How can metrics be used to assess code quality or the effectiveness of the testing process? | 5 | 2 | 5 |
| | | **OR** | | | |
| **11.** | **a).** | Contrast black-box testing with white-box testing, including one advantage of each approach. | 5 | 2 | 5 |
| | **b).** | Briefly explain how following coding guidelines such as DRY and KISS contributes to better software quality | 5 | 2 | 5 |

**CO-COURSE OUTCOME** **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE : Questions can be given as A,B splits or as a single Question for 10 marks