R22

Code No: R22A0503

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

II B.Tech I Semester Supplementary Examinations, June 2024

Data Structures

(CSE, IT, CS&IT, CSE-CS, CSE-AIML, CSE-DS, CSE-IOT & B.Tech-AIML)

Roll No										

Time: 3 hours **Max. Marks: 60**

Note: This question paper contains two parts A and B
Part A is compulsory which carries 10 marks and Answer all questions.
Part B Consists of 5 SECTIONS (One SECTION for each UNIT). Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 10 marks.

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PART-A (10 Marks)

Write all answers of this PART at one place

1	A	What is Data Abstraction.	**[1M]**
	B	What is the use of function overloading?	**[1M]**
	C	Write the general procedure of linear search method.	**[1M]**
	D	Write Bubble sort technique.	**[1M]**
	E	Give any two examples of non linear data structures .	**[1M]**
	F	Write any two applications of stacks.	**[1M]**
	G	What is the key difference between linear list representation and skip list representation?	**[1M]**
	H	Define 'in degree' and 'out degree' of a node in graph.	**[1M]**
	I	Define BST(Binary Search Tree) and give an example.	**[1M]**
	J	Define depth or height of a binary tree.	**[1M]**

PART-B (50 Marks)

SECTION-I

2	A	How can the function overloading be achieved? Explain with an example.	**[5M]**
	B	What is Constructor? Explain it's use with an example code.	**[5M]**
		OR	
3	A	Explain multiple Inheritance with an example.	**[5M]**
	B	What are Abstract classes? Briefly discuss the role of abstract classes in the development of complex software applications.	**[5M]**

SECTION-II

4	A	Write the step by step procedure to partition the list based on the pivot as part of quick sort algorithm.	**[5M]**
	B	Trace merge sort algorithm on the following list of numbers: 10, 15, 22, 8, 4, 25, 20, 17	**[5M]**
		OR	
5	A	Write an algorithm for sorting the unordered list using selection sort method.	**[5M]**
	B	Is it possible to implement Binary Search procedure on unsorted list?	**[5M]**

Justify your answer with suitable justification.

SECTION-III

6	A	"Array is not suitable representation structure for representing priority queue" - Justify this statement.	**[5M]**
	B	Define priority queue and write short note on suitable representation method of priority queue.	**[5M]**
		OR	
7	A	Illustrate the use of stack in evaluating the following post fix expression: ab+cd-2*	**[5M]**
	B	Define Queue and Circular Queue. Write the underflow and overflow conditions on Queue and Circular Queue.	**[5M]**

SECTION-IV

8	A	Write an algorithm for DFS(Depth First Search).	**[5M]**
	B	"Adjacency Matrix of a directed graph is not symmetric" - Justify this statement.	**[5M]**
		OR	
9	A	Define the following terms connected to Graph with examples: i) Path ii) Degree of node iii) Connected Graph iv) Weighted Graph v) Unweighted Graph	**[5M]**
	B	Write short note the advantages and limitations of Adjacency Matrix as compared to Adjacency List representation of a graph.	**[5M]**

SECTION-V

10	A	Define AVL tree . Construct AVL tree from the following list of numbers : 10, 25, 15, 20, 18, 6, 2, 5	**[5M]**
	B	Take an example full binary tree of depth '3' and write it's inorder traversal.	**[5M]**
		OR	
11	A	Define BST. Write the general procedure for constructing a BST from the given list of numbers.	**[5M]**
	B	Define Expression tree and construct an expression tree for the following infix expression: a + b / (c – d) * (2+4)	**[5M]**

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R22

Code No: R22A0504

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

II B.Tech I Semester Supplementary Examinations, June/July 2024

Database Management Systems

(CSE, IT, CSE-CS & CSE-IOT)

Roll No										

Time: 3 hours **Max. Marks: 60**

Note: This question paper contains two parts A and B
Part A is compulsory which carries 10 marks and Answer all questions.
Part B Consists of 5 SECTIONS (One SECTION for each UNIT). Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 10 marks.

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PART-A (10 MARKS)

(Write all answers of this PART at one place)

1	A	What are the responsibilities of the DBA and the database designers?	**[1M]**
	B	List the various cases where use of a NULL value would be appropriate.	**[1M]**
	C	What role does the concept of foreign key play when specifying the most common types of meaningful join operations?	**[1M]**
	D	Differentiate between group by and order by clauses in SQL. Give suitable examples.	**[1M]**
	E	Why are certain functional dependencies called trivial functional dependencies?	**[1M]**
	F	Why do practical database designs typically aim for BCNF and not aim for higher normal forms?	**[1M]**
	G	What is the system log used for? What are the typical kinds of records in a system log? What are transaction commit points, and why are they important?	**[1M]**
	H	What is the two-phase locking protocol? How does it guarantee serializability?	**[1M]**
	I	Identify three typical lists of transactions that are maintained by the recovery subsystem.	**[1M]**
	J	What are buffer management policies.	**[1M]**

PART-B (50 MARKS)

SECTION-I

2	A	What four main types of actions involve databases? Briefly discuss each.	**[5M]**
	B	Explain the difference between two-tier and three-tier architectures. Which is better suited for Web applications? Why?	**[5M]**
		OR	
3	A	Can an identifying relationship of a weak entity type be of a degree greater than two? Explain with examples to illustrate your answer.	**[5M]**
	B	A database is being constructed to keep track of the teams and games of a sports league. A team has a number of players, not all of whom participate in each game. It is desired to keep track of the players participating in each game for each team, the positions they played in that game, and the result of the game. Design an ER schema diagram for this application, stating any assumptions you make. Choose your favorite sport (e.g., soccer, baseball, football).	**[5M]**

SECTION-II

4	A	How are the OUTER JOIN operations different from the INNER JOIN operations? Explain how is the OUTER UNION operation different from UNION?	**[5M]**
	B	How does SQL allow implementation of the entity integrity and referential integrity constraints described in E-R? What about referential triggered actions? Explain.	**[5M]**
		OR	
5	A	Describe the four clauses in the syntax of a simple SQL retrieval query. Show what type of constructs can be specified in each of the clauses. Which are required and which are optional?	**[5M]**

B Consider the instance of sailors , boats, reserves database . construct queries in relational algebra. **[5M]**

Sailors(sid int, sname string, rating int, age real)
Boats(bid int, bname string, bcolor string),
Reserves(sid int, bid int, day date).

i) Find the names of sailors who have reserved boat 103.
ii) Find the names of sailors who have reserved a red or a green boat..
iii) Find the colors of boats reserved by Lubber.

Find the sids of sailors with age over 20 who have not reserved a red boat

SECTION-III

6 A Suppose that we decompose the schema r (A, B, C, D, E) into **[5M]**

$r1(A, B, C)$
$r2(A, D, E)$

Show that this decomposition is a lossless decomposition if the following set F of functional dependencies holds:

$A \rightarrow BC$, $CD \rightarrow E$, $B \rightarrow D$, $E \rightarrow A$

B Consider a relation $R(A, B, C, D, E)$ with the following dependencies: **[5M]**

$AB \rightarrow C$, $CD \rightarrow E$, $DE \rightarrow B$

Is AB a candidate key of this relation? If not, is ABD? Explain your answer.

OR

7 A Show that it is possible to ensure that a dependency-preserving decomposition into 3NF is a lossless decomposition by guaranteeing that at least one schema contains a candidate key for the schema being decomposed. (*Hint*: Show that the join of all the projections onto the schemas of the decomposition cannot have more tuples than the original relation.) **[5M]**

B Discuss about Join dependencies and Fifth normal form? **[5M]**

SECTION-IV

8 A What is meant by the concurrent execution of database transactions in a multiuser system? Discuss why concurrency control is needed and give informal examples. **[5M]**

B Add the operation commit at the end of each of the transactions T1 and T2 in the below Figure, and then list all possible schedules for the modified transactions. Determine which of the schedules are recoverable, which are cascadeless, and which are strict. **[5M]**

(a)

T_1

read_item(X);
$X := X - N$;
write_item(X);
read_item(Y);
$Y := Y + N$;
write_item(Y);

(b)

T_2

read_item(X);
$X := X + M$;
write_item(X);

OR

9 A Discuss the timestamp ordering protocol for concurrency control. How does strict timestamp ordering differ from basic timestamp ordering? **[5M]**

B When a transaction is rolled back under timestamp ordering, it is assigned a new timestamp. Why can it not simply keep its old timestamp? **[5M]**

SECTION-V

10 A Discuss the different types of transaction failures. What is meant by catastrophic failure? **[5M]**

B What is the system log used for? What are the typical kinds of entries in a system log? What are checkpoints, and why are they important? What are transaction commit points, and why are they important? Explain. **[5M]**

OR

11 A Compare log-based recovery with the shadow-copy scheme in terms of their overheads, for the case when data is being added to newly allocated disk pages. **[5M]**

B Physiological redo logging can reduce logging overheads significantly, especially with a slotted page record organization. Explain why. **[5M]**

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R22

Code No: R22A0505

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

II B.Tech I Semester Supplementary Examinations, June/July 2024

Software Engineering

(CSE, IT, CSE-AIML & B.Tech-AIML)

Roll No										

Time: 3 hours **Max. Marks: 60**

Note: This question paper contains two parts A and B
Part A is compulsory which carries 10 marks and Answer all questions.
Part B Consists of 5 SECTIONS (One SECTION for each UNIT). Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 10 marks.

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PART-A (10 Marks)

Write all answers of this PART at one place)

1	A	What characterizes a layered technology in the context of Software Engineering?	**[1M]**
	B	What distinguishes the Agile methodology from the Spiral model in software development?	**[1M]**
	C	Define the software requirements document.	**[1M]**
	D	What is the purpose of requirements management in software development?	**[1M]**
	E	What is the role of software architecture in the development process?	**[1M]**
	F	Mention one example of an architectural style or pattern commonly used in software design.	**[1M]**
	G	What is the significance of software measurement in the development process?	**[1M]**
	H	Briefly explain the purpose of the art of debugging in software engineering.	**[1M]**
	I	What are the primary objectives of Software Quality Assurance?	**[1M]**
	J	Briefly describe ISO 9000 quality standards in software engineering.	**[1M]**

PART-B (50 Marks)

SECTION-I

2	A	Discuss the significance of having a process framework in Software Engineering. Illustrate its importance in managing software development projects effectively.	**[5M]**
	B	Explain the concept of a generic view of the software engineering process. How does it facilitate understanding and management of software development activities?	**[5M]**

OR

3	A	Evaluate the significance of the Capability Maturity Model Integration (CMMI) in improving software development processes for organizations. Highlight its levels and the benefits associated with each level.	**[5M]**
	B	Discuss the key phases/stages involved in the Spiral model of software development and how these phases mitigate risks throughout the project lifecycle.	**[5M]**

SECTION-II

4	A	Discuss the significance of functional requirements in software engineering. Provide examples to illustrate their importance in software development.	**[5M]**
	B	Explain the key characteristics of non-functional requirements. How do they differ from functional requirements, and why are they essential in software development?	**[5M]**

OR

5	A	Describe the process of requirements elicitation and analysis in software engineering. Highlight its challenges and methods to mitigate them.	**[5M]**
	B	Discuss the importance of feasibility studies in the requirements engineering process. Provide examples of how feasibility studies influence software project outcomes.	**[5M]**

SECTION-III

6	A	Draw and explain any two UML diagrams for library management systems.	**[5M]**
	B	Explain the process of creating an architectural design in software engineering. Discuss the essential components involved, such as software architecture, data design, and component diagrams. Provide examples to support your explanation.	**[5M]**

OR

7	A	Discuss the conceptual model of UML (Unified Modeling Language) in detail. Explain its significance and how it aids in the architectural design phase of software engineering.	**[5M]**
	B	Compare and contrast different types of UML diagrams (e.g., class diagrams, sequence diagrams, collaboration diagrams, use case diagrams, component diagrams). Highlight their specific uses and discuss how they contribute to the software design process.	**[5M]**

SECTION-IV

8	A	How does the art of debugging impact the software development process? Explain the importance of effective debugging techniques in delivering high-quality software products.	**[5M]**
	B	Explain the concept of software measurement and its role in improving software development processes. Provide examples of commonly used software metrics and their significance in assessing software quality.	**[5M]**

OR

9	A	Compare and contract white box testing with black box testing.	**[5M]**
	B	Compare and contrast different software testing metrics used to evaluate the effectiveness of test cases. Discuss their relevance in improving the overall software testing process and ensuring product quality.	**[5M]**

SECTION-V

10	A	Describe the ISO 9000 quality standards and their relevance to software engineering practices.	**[5M]**
	B	Discuss the significance of RMMM (Risk Mitigation, Monitoring, and Management) in handling software risks, and outline its key components.	**[5M]**

OR

11	A	Explain about Reactive Risk versus proactive Risk strategy.	**[5M]**
	B	Elaborate on the fundamental concepts of software quality and its importance in software engineering.	**[5M]**

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R22

Code No: R22A0506

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

II B.Tech I Semester Supplementary Examinations, June/July 2024

Design and Analysis of Algorithms

(CSE, IT & CS&IT)

Roll No										

Time: 3 hours **Max. Marks: 60**

Note: This question paper contains two parts A and B
Part A is compulsory which carries 10 marks and Answer all questions.
Part B Consists of 5 SECTIONS (One SECTION for each UNIT). Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 10 marks.

PART-A (10 marks)

Write all answers of this part at one place)

1	A	Discuss the general plan of divide and conquer technique.	**[1M]**
	B	What is omega notation?	**[1M]**
	C	Explain Bi-connected components.	**[1M]**
	D	What is the greedy algorithm method? Given any two examples.	**[1M]**
	E	Differentiate Divide and Conquer Method vs Dynamic Programming.	**[1M]**
	F	Define principle of optimality.	**[1M]**
	G	What are the implicit and explicit constraints?	**[1M]**
	H	Illustrate Hamiltonian cycles.	**[1M]**
	I	Define non-deterministic algorithm for problem solving.	**[1M]**
	J	List out the differences between backtracking and branch and bound.	**[1M]**

PART-B (50 marks)

SECTION-I

2	A	Indicate whether first function of each of the following pairs has a smaller, same or larger order of growth than second function. i. $n (n + 1)$ and $2000n^2$ ii. $100n^2$ and $0.01n^3$ iii. $\log_2 n$ and $\log_e n$ iv. 2^{n-1} and 2^n v. $\text{Log}_2 n$ and $\log_2 n^2$ vi. $(n-1)!$ And $n!$	**[5M]**
	B	Show each step in sorting the below list using quick sort. 5, 3, 1, 9, 8, 2, 4, 7	**[5M]**
		OR	
3	A	What do you mean by Performance Analysis of an Algorithm?	**[5M]**
	B	Write the intermediate steps in sorting the following elements using merge sort: 54, 43, 1, 9, 5, 36, 23	**[5M]**

SECTION-II

4	A	Explain the working of single source shortest path algorithm with an example.	**[5M]**
	B	Solve the following knapsack problem where M=40 and N=4 using greedy technique. Weights [W1, W2, W3, W4] = [20, 25, 10, 15] Profits [P1, P2, P3, P4] = [20, 40, 35, 45]	**[5M]**
		OR	
5	A	Explain the importance of Spanning tree. Write the Kruskals Minimum	**[5M]**

spanning Tree Algorithm with suitable example.

B Construct the optimal schedule for the following data. **[5M]**

Jobs	J1	J2	J3	J4	J5	J6	J7	J8	J9
Profit	85	25	16	40	55	19	92	80	15
Deadline	5	4	3	3	4	5	2	3	7

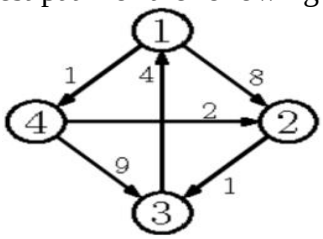
SECTION-III

6 A Define Optimal Binary Search Tree and explain how it is used to reduce the cost of binary search tree with an example. **[5M]**

B Find the minimum number of multiplications required for following matrices A1=2x3, A2=3x8, A3=8x5, A4=5x7 using dynamic programming. **[5M]**

OR

7 A Compute all pairs shortest path for the following graph **[5M]**

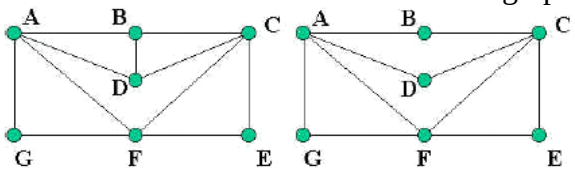


B Discuss how dynamic programming approach can be used for 0/1 knapsack problem. **[5M]**

SECTION-IV

8 A Write a backtracking algorithm for the sum of subsets problem. **[5M]**

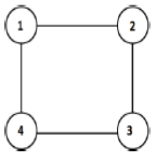
B What is a Hamiltonian Circuit? List any four real life applications of Hamiltonian Circuit. Find Hamilton circuit for these graphs. **[5M]**



OR

9 A Explain the concept of n-queens problem with suitable example. **[5M]**

B Provide the diagram for the state space tree for n=4 and m=3 colors such as(R, B, G). **[5M]**



SECTION-V

10 A Define P, NP and NP complete problems with examples. **[5M]**

B Write the algorithm for 0/1 knapsack problem using LC branch and bound technique. Trace the algorithm to find optimal solution to the knapsack instance of n = 4, m=10, profit (p1, p2, p3, p4) = (10, 10, 12, 18), weights (w1, w2, w3, w4) = (4, 7, 5, 3). **[5M]**

OR

11 A Explain about Cook's theorem. **[5M]**

B Differentiate between NP-hard and NP complete problems. Give an example for each. **[5M]**

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R22

Code No: R22A0026

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

II B.Tech I Semester Supplementary Examinations, June/July 2024

Probability Statistics and Queueing Theory

(CSE, IT, CS&IT, CSE-CS & CSE-IOT)

Roll No										

Time: 3 hours **Max. Marks: 60**

Note: This question paper contains two parts A and B
Part A is compulsory which carries 10 marks and Answer all questions.
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PART-A (10 Marks)

Write all answers of this PART at one place

1	A	Define probability density function.	**[1M]**
	B	Define random variable.	**[1M]**
	C	Define normal distribution.	**[1M]**
	D	List the properties of Poisson distribution.	**[1M]**
	E	Define rank correlation coefficient properties.	**[1M]**
	F	Define regression line Y on X.	**[1M]**
	G	Define Type-I and Type-II errors.	**[1M]**
	H	Write test statistics for single mean.	**[1M]**
	I	What is M/M/1 queuing model?	**[1M]**
	J	Define balking.	**[1M]**

PART-B (50 Marks)

SECTION-I

2 A random variable X has the following probability function: **[10M]**

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

Then find (i) K (ii) Expectation (iii) The Variance

OR

3 The probability density function f(x) of a continuous random variable is given by $f(x) = c\,e^{-|x|}$, $-\infty < x < \infty$. Show that c=1/2 and find that the mean and variance of the distribution. **[10M]**

SECTION-II

4 A Ten coins are thrown simultaneously. Find the probability of getting (i) at least seven heads (ii) six heads **[5M]**

B If the probability that an individual suffers a bad reaction from a certain injection is 0.001, determine the probability that out of 2000 individuals (i) exactly 3 (ii) more than 2 individuals (iii) none (iv) more than one individual suffers a bad reaction **[5M]**

OR

5 If the masses of 300 students are normally distributed with mean 68 kgs and standard deviation 3 kgs , how many students have masses **[10M]**

(i) Greater than 72 kgs

(ii) Less than or equal to 64 kg

Between 65 and 71 kg inclusive.

SECTION-III

6 Price indices of cotton and wool are given below for the 12 months of a year. Obtain the equations of lines of regression between indices. **[10M]**

Price index of cotton(X)	78	77	85	88	87	82	81	77	76	83	97	93
Price index of wool (Y)	84	82	82	85	89	90	88	92	83	89	98	99

OR

7 Fit a curve of the form $y = ax^2 + bx + c$ for the following data **[10M]**

x	10	15	20	25	30	35
y	35.3	32.4	29.2	26.1	23.2	20.5

SECTION-IV

8 A What is the maximum error one can expect to make with probability 0.90 when using the mean of a random sample of size n=64 to estimate the mean of population with $\sigma^2 = 2.56$. **[5M]**

B Write a procedure of Testing of Hypothesis. **[5M]**

OR

9 A In sample of 1000 people in Karnataka 540 are rice eaters and the rest are wheat eaters. Can we assume that both rice eaters and wheat eaters are equally popular in this state of Karnataka. **[5M]**

B A researcher wants to know the intelligence of students in a school. He selected two groups of students. In the first group there 150 students having mean IQ of 75 with S.D of 15 in the second group there are 250 students having mean IQ of 70 with S.D of 20. Is there is significance difference between the means of 2 groups. **[5M]**

SECTION-V

10 A toll gate is operated on a frequency where cars arrive according to a Poisson distribution with mean frequency of 1.2 cars per minute. The time of completing payment follows an exponential distribution with mean of 20 seconds. Fine **[10M]**

(i) The idle time of the customer
(ii) Average number of cars in the system
(iii) Average number of cars in the queue
(iv) Average time that a car spends in the system
(v) Average time that a car spends in the queue.
(vi) The probability that a car spends more than 30 seconds in the system.

OR

11 A fast food restaurant has one drive-in window. It is estimated that cars arrive according to Poisson distribution at the rate of 2 every 5 minutes and that there is enough space to accommodate a line f 10 cars. Other arriving cars can wait outside this space, if necessary. It takes 15 minutes on the average to fill an order, but the service time actually varies according to an exponential distribution. Determine the following **[10M]**

(i) The probability that the facility is idle.
(ii) The expected number of customers waiting to be served.

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