Code No: R22A0503 **R22**

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

II B.Tech I Semester Regular Examinations, January 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

(Write all answers of this part at one place)

1	A	Define Object and Class.	**[1M]**
	B	Define Inheritance.	**[1M]**
	C	What is searching and sorting?	**[1M]**
	D	Define Data Structure.	**[1M]**
	E	Define stack.	**[1M]**
	F	Define Queue.	**[1M]**
	G	Define Graph and give an example.	**[1M]**
	H	What is skip list?	**[1M]**
	I	Define binary tree and give an example.	**[1M]**
	J	Define root node and leaf node of tree.	**[1M]**

PART-B

SECTION-I

2	A	Explain the basic concepts of OOP.	**[5M]**
	B	Define Inheritance and write short note on Single Inheritance.	**[5M]**
		OR	
3	A	Write a sample code in Python language to illustrate the working of Method Overloading .	**[5M]**
	B	Define Constructor. Write short note on different types of constructors.	**[5M]**

SECTION-II

4	A	Write a procedure to search for an item in a sorted list using Binary Search method	**[5M]**
	B	Illustrate the bubble sort procedure by sorting the following unsorted list: 23, 5, 11, 10, 8, 2, 55, 25	**[5M]**
		OR	
5	A	Write a procedure to search for an item in an unsorted list using Linear Search method	**[5M]**
	B	Write a procedure to merge two sorted lists into a single sorted list.	**[5M]**

SECTION-III

6	A	Distinguish between linear and nonlinear Data Structures.	**[5M]**

	B	Explain the node structure of single linked list and double linked list.	**[5M]**
		OR	
7	A	Write a procedure for PUSH and POP operations on stacks.	**[5M]**
	B	Write a procedure to perform insertion and deletion operations on queues.	**[5M]**
		SECTION-IV	
8	A	What is skip list representation? Explain with an example.	**[5M]**
	B	Define Dictionary. Write the procedure to perform insertion and deletion of operations on Dictionary.	**[5M]**
		OR	
9	A	Define Graph. Explain any one of the Graph representation methods.	**[5M]**
	B	Explain adjacency list representation of Graph.	**[5M]**
		SECTION-V	
10	A	Explain the representation of the Binary Trees using arrays.	**[5M]**
	B	Distinguish between B Tree and B+ Tree.	**[5M]**
		OR	
11	A	Construct the Binary tree from the following Traversal Orders: In-order- C B A G E F H Pre-order- A B C E G F H	**[5M]**
	B	Define BST. Construct BST from the following list of numbers: 15, 8, 10, 6, 2, 5, 20, 25 ---- Show the step by step process.	**[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 Regular Examinations, January 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	List four applications of database system.	**[1M]**
	B	What is an entity type?	**[1M]**
	C	What is a union and intersection operation?	**[1M]**
	D	Define group by clause in SQL with an example.	**[1M]**
	E	Define Normalization.	**[1M]**
	F	What is functional dependency?	**[1M]**
	G	What is transaction?	**[1M]**
	H	What is two-phase locking protocol?	**[1M]**
	I	Discuss different types of failures in transaction?	**[1M]**
	J	What is check point?	**[1M]**

PART-B (50 MARKS)

SECTION-I

2	A	Write four main types of applications involving databases? Briefly discuss each.	**[5M]**
	B	Discuss architecture of DBMS.	**[5M]**
		OR	
3	A	What is a relationship type? Explain the differences among a relationship instance, a relationship type, and a relationship set.	**[5M]**
	B	Design a database for an airline. The database must keep track of customers and their reservations, flights and their status, seat assignments on individual flights, and the schedule and routing of future flights. Your design should include an E-R diagram, a set of relational schemas, and a list of constraints, including primary-key and foreign-key constraints.	**[5M]**

SECTION-II

4	A	Discuss the various types of join operations. Why is join required?	**[5M]**
	B	Explain the relational algebra operations with an example.	**[5M]**
		OR	
5	A	Explain TRC and DRC with relevant examples.	**[5M]**
	B	Consider the following schema. construct the queries in SQL for creation of tables and given questions below. Dept(deptno: int, dname: string, loc : string)	**[5M]**

Emp(empno: int, ename: string, job: string, sal: num, deptno:num,comm real)

1. List all employee details who belongs to deptno=10 and whose job is clerk
2. Find employee details who have same job as blake?
3. Update emp table by changing sal, comm. to 2000 &500 to an employe with empno 7844
4. Display employee names, employee number, deptname & location of all employees?

SECTION-III

6 A Explain 3.5NF, 4NF, 5NF Normal forms. **[5M]**

B What is functional dependency? Explain the different types functional dependencies **[5M]**

OR

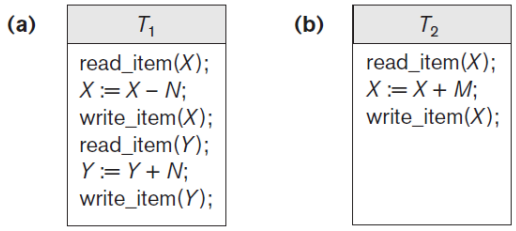
7 A Consider the universal relation $R = \{A, B, C, D, E, F, G, H, I, J\}$ and the set of functional dependencies $F = \{\{A, B\} \rightarrow \{C\}, \{A\} \rightarrow \{D, E\}, \{B\} \rightarrow \{F\}, \{F\} \rightarrow \{G, H\}, \{D\} \rightarrow \{I, J\}\}$. What is the key for R? Decompose R into 2NF and then 3NF relations. **[5M]**

B Define normalization? Explain 1NF, 2NF, 3NF Normal forms **[5M]**

SECTION-IV

8 A What is a serial schedule? What is a serializable schedule? Explain types of serializability. **[5M]**

B List all possible schedules for transactions T1 and T2 in the below Figure and determine which are conflict serializable (correct) and which are not. **[5M]**



OR

9 A What is log based protocol? Explain 2PL and strict 2PL **[5M]**

B Explain two-phase locking protocol. **[5M]**

SECTION-V

10 A How are buffering techniques used by the recovery subsystem? Explain **[5M]**

B Explain checkpoint log based recovery technique. **[5M]**

OR

11 A Explain why logical undo logging is used widely, whereas logical redo logging (other than physiological redo logging) is rarely used. **[5M]**

B Stable storage cannot be implemented. Explain why it cannot be. Explain how database systems deal with this problem. **[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 Regular Examinations, January 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	Define Capability Maturity Model Integration (CMMI) briefly.	**[1M]**
	B	Enumerate one advantage of the Waterfall model in software development.	**[1M]**
	C	Explain the difference between user requirements and system requirements.	**[1M]**
	D	What is interface specification in software requirements?	**[1M]**
	E	Explain the term 'Design Model' in software engineering.	**[1M]**
	F	Define class diagram?	**[1M]**
	G	Explain the concept of 'White-box testing.'	**[1M]**
	H	Define 'System testing' in software development.	**[1M]**
	I	Explain Risk Projection in the context of Software Engineering.	**[1M]**
	J	Define RMMM in Risk Management for Software Development.	**[1M]**

PART-B (50 Marks)

SECTION-I

2	A	Compare and contrast the Waterfall model and the Spiral model in software development, highlighting their strengths and weaknesses..	**[5M]**
	B	How does the Capability Maturity Model Integration (CMMI) contribute to improving software development processes? Explain with relevant examples.	**[5M]**
		OR	
3	A	Why are software myths prevalent, and how do they impact the perception of software development? Provide examples of commonly held software myths and their implications.	**[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]**

SECTION-II

4	A	Explain the concept of requirements validation in software engineering. Discuss different techniques used for requirements validation and their importance in ensuring software quality.	**[5M]**
	B	Compare and contrast functional and non functional requirements. How do these types of requirements influence the software development process differently?	**[5M]**

OR

5	A	Illustrate the importance of software requirement specification (SRS) with an example.	**[5M]**
	B	Elaborate on the elements typically included in a software requirements document. Explain the importance of each of these elements in the software development lifecycle.	**[5M]**

SECTION-III

6	A	Explain the steps involved in the Design Process in software engineering. Elaborate on the significance of each step.	**[5M]**
	B	Draw and explain two UML diagrams for library management system.	**[5M]**

OR

7	A	Describe the role of software architecture in creating an effective software solution. Explain how architectural decisions impact the development process.	**[5M]**
	B	Compare and contrast different architectural styles and patterns commonly used in software design. Provide examples and elucidate on their advantages and disadvantages.	**[5M]**

SECTION-IV

8	A	Define and explain the concept of 'validation testing.' Discuss its role in ensuring the quality and correctness of software products, providing examples to support your explanation.	**[5M]**
	B	Describe the difference between black-box and white-box testing techniques in software testing. Provide examples of scenarios where each approach is most beneficial.	**[5M]**

OR

9	A	How do software metrics contribute to improving the software development process? Discuss their role in identifying potential risks, enhancing productivity, and ensuring quality throughout the project lifecycle.	**[5M]**
	B	Discuss the differences between verification and validation in the context of software testing. Explain their significance and how they contribute to ensuring software quality.	**[5M]**

SECTION-V

10	A	Discuss the importance of Risk Identification, Projection, and Refinement in the context of software development, outlining their respective roles and benefits.	**[5M]**
	B	Discuss how Statistical Software Quality Assurance methods differ from traditional Software Quality Assurance approaches, citing examples to illustrate their effectiveness.	**[5M]**

OR

11	A	Compare and contrast Reactive and Proactive Risk Strategies in Software Engineering, providing examples of each.	**[5M]**
	B	Analyze about ISO 9000 quality standards.	**[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 Regular Examinations, January 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.

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PART-A (10 MARKS)

(Write all answers of this part at one place)

1	A	Define algorithm. What are the characteristic of an algorithm?	[1M]
	B	Discuss steps for analyzing the time complexity of a non-recursive algorithm.	[1M]
	C	What are Union and Find algorithms.	[1M]
	D	Compare the greedy technique with dynamic programming.	[1M]
	E	Find the minimum number of multiplications required for following matrices A1=5×4, A2=4×6, A3=6×2 using Dynamic Programming?	[1M]
	F	What is meant by principle of optimality?	[1M]
	G	Define backtracking.	[1M]
	H	Define bounding function ?	[1M]
	I	Describe about FIFO branch and bound.	[1M]
	J	What are the advantages of non-deterministic algorithms?	[1M]

PART-B (50 MARKS)

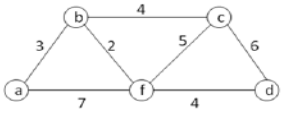
SECTION-I

2	A	Write the binary search algorithm.	[5M]
	B	Find an asymptotic upper bound for the recurrence $T(n) = T(n - a) + T(a) + n$ where $a \geq 1$ is constant.	[5M]
		OR	
3	A	Discuss briefly about various asymptotic notations with examples.	[5M]
	B	Apply Quick sort to arrange the given elements: 60, 50, 25, 10, 35, 25, 75 in an ascending order.	[5M]

SECTION-II

4	A	Can Prims and Kruskals algorithm yield different minimum spanning tree? Explain.	[5M]
	B	Solve the job sequencing problem given n=5, profits (1, 5, 20, 15, 10) and deadlines (1, 2, 4, 1, 3) using greedy strategy.	[5M]
		OR	
5	A	Explain the applications of Greedy method and also give the formal definition of knapsack problem using greedy approach with an example.	[5M]
	B	Trace the following graph using Dijikstra's algorithm to find shortest	[5M]

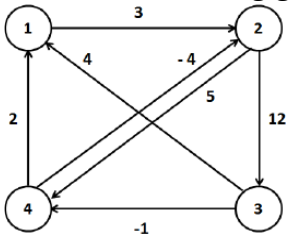
path from vertex ‘a’ to all other vertices.



SECTION-III

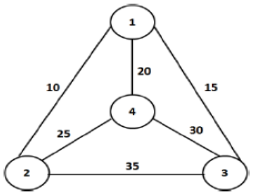
6 A Solve the following instance of 0/1 knapsack problem using dynamic programming: n = 4, (w1, w2, w3, w4) = (10, 15, 6, 9), (p1, p2, p3, p4) = (2, 5, 8, 1) and M = 25. [5M]

B Find All pairs shortest paths for the following graph: [5M]



OR

7 A Given a set of cities and distance between every pair of cities, the problem is to find the shortest possible route that visits every city exactly once and returns to the starting point (TSP). [5M]



B Construct Optimal Binary Search Tree for n=3, identifiers (a1, a2, a3)=(do, if, while), probabilities p(1 : 3)=(3, 3, 1) and q(0 : 3)=(2, 3, 1, 1). [5M]

SECTION-IV

8 A Explain about Hamiltonian cycles. [5M]

B Define sum of subsets problem. Let m=22 and w={5, 6, 11, 13, 22}. Find all possible subsets of w that sum to m. Draw the portion of the state space tree that is generated. [5M]

OR

9 A Discuss n-Queens problem and represent state-space tree of solving four-queens problem. [5M]

B Discuss in detail about graph coloring problem. [5M]

SECTION-V

10 A With an algorithm, explain nondeterministic sorting. [5M]

B Consider the knapsack instance n=4, (p1, p2, p3, p4) = (10, 10, 12, 18) (w1, w2, w3, w4) = (2, 4, 6, 9) and M=15. Draw the LC branch and bound tree for the above. [5M]

OR

11 A Explain about P, NP classes [5M]

B Explain Cook’s theorem and its significance for NP-Hard and NP-Complete problems. [5M]

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Code No: R22A0026 **R22**

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

II B.Tech I Semester Regular Examinations, January 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.
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	Define probability	**[1M]**
	B	Define discrete random variable.	**[1M]**
	C	Define Poisson distribution.	**[1M]**
	D	Define mean and variance of normal distribution.	**[1M]**
	E	Write Karl Pearson's coefficient of correlation.	**[1M]**
	F	Define rank correlation coefficient.	**[1M]**
	G	Define alternative hypothesis.	**[1M]**
	H	Define critical region.	**[1M]**
	I	Define pure birth and death process.	**[1M]**
	J	Define jockeying.	**[1M]**

PART-B (50 Marks)

SECTION-I

2 A A sample of 4 items is selected at random from a box containing 12 items of which 5 are defective. Find the expected number E of defective items. **[5M]**

B A random variable X has the following probability function : **[5M]**

X	0	1	2	3	4	5	6	7
P(x)	0	K	2K	2K	3K	K^2	$2K^2$	$7K^2+K$

Determine K (ii) Evaluate P(X<6), P(0<X<5)

OR

3 A continuous random variable has the probability density function **[10M]**

$f(x) = k\,x\,e^{-\lambda x},\ for\ x \geq 0,\ \lambda > 0,\qquad = 0,\ otherwise$

Determine (i)k (ii) Mean (iii) Variance

SECTION-II

4 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.

OR

5 A If X is normal variate with mean 30 and standard deviation 5. Find the probabilities that $(i)\ 26 \leq X \leq 40 \qquad (ii)\ X \geq 45.$ **[5M]**

B Given that the mean height of students in a class is 158 cms with standard deviation of 20 cms. Find how many students heights lie between 150 cms and 170 cms, if there are 100 students in the class. **[5M]**

SECTION-III

6 Calculate the coefficient of correlation between age of cars and annual maintenance cost and comment : **[10M]**

Age of cars (years)	2	4	6	7	8	10	12
Annual maintenance cost (Rupees)	1600	1500	1800	1900	1700	2100	2000

OR

7 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

SECTION-IV

8 A population consists of five numbers 2,3,6,8 and 11. Consider all possible samples of size two which can be drawn with replacement from this population. Find **[10M]**

(i) The mean of the population.
(ii) The standard deviation of the population.
(iii)The mean of sampling distribution of means and
The standard deviation of the sampling distribution of means.

OR

9 A The mean and standard deviation of a population are 11,795 and 14,054 respectively. If n=50, find 95% confidence interval for the mean. **[5M]**

B Define (i) Type I and Type II errors (ii) One tailed and two tailed tests **[5M]**

SECTION-V

10 A self service canteen employs one cashier as its counter. 8 customers arrive per every 10 minutes on an average. The cashier can service on average one per minute. Assuming that the arrivals are Poisson and the service time distribution is exponential, determine **[10M]**

(i) The average number of customers in the system
(ii) The average queue length
(iii) Average time a customer spends in the system
(i) Average waiting time of each customer.

OR

11 A one person barber shop has six chairs to accommodate people waiting for haircut. Assume who arrive when all the six chairs are full leave without entering the shop. Customers arrive at the average rate of 3 per hour and spend an average of 15 minutes for service. Find **[10M]**

(i) The probability that a customer can get directly into the barber chair upon arrival.
(ii) Expected number of customers waiting for a haircut.
(iii)Effective arrival rate.
The time a customer can expect to spend in the barber shop.

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