R24

MCA I SEM

END EXAMINATION QUESTION PAPERS

REGULAR

DEC. 2025

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

I MCA I Semester Regular & Supple. Examinations, December-2025

R24

Sub Code: R24MCA101 **DATA STRUCTURES**

Time: 3 hours Max. Marks: 60

Note: Answer All **FIVE** Questions. All Questions Carry Equal Marks (5 X 12M = 60M)

Q.No		Questions	KL	CO	M
		Unit-I			
1	a	Describe all categories of operators in C—arithmetic, relational, logical, assignment, bitwise, and conditional operators—with suitable examples.	I	1	12M
		OR			
	b	i) Explain one-dimensional and two-dimensional arrays in C. Explain their declaration, initialization, and memory allocation	II	1	6M
		ii) List and explain various looping constructs in C (for, while, do-while). Discuss their syntax, flowcharts, and situations where each is used.	I	1	6M
		Unit-II			
2	a	i) Write a C program to demonstrate Call by Reference using pointers. Explain how the actual parameters are modified.	II	2	6M
		ii) List and explain different file modes in C. Describe what operations are allowed in each mode.	I	2	6M
		OR			
	b	i) Construct a C program that reads content from a file and counts the number of words, lines, and characters. Explain the logic used.	III	2	6M
		ii) Analyze the differences in memory usage and behavior between structures and unions when storing multiple data types. Provide an example	IV	2	6M
		Unit-III			
3	a	i) Explain linear recursion and binary recursion with proper definitions and examples.	II	3	6M
		ii) Develop an algorithm for inserting a new node at the beginning and end of a singly linked list. Illustrate with diagrams.	III	3	6M
		OR			
	b	i) Explain the concept of circular linked lists. Discuss how the last node points back to the first node with diagrams.	II	3	6M
		ii) Analyze the structure and behavior of doubly linked lists. Compare forward and backward traversal and explain the memory overhead.	IV	3	6M
		Unit-IV			
4	a	i) Write an algorithm to implement push and pop operations in a stack using arrays. Illustrate each step with an example.	III	4	6M
		ii) Define collision in hashing. List and explain collision resolution techniques such as linear probing, quadratic probing, and double hashing.	I	4	6M
		OR			
	b	i) Convert the given in-fix expression to post-fix expression: (a + b) /(c *d) / e	III	4	6M
		ii) Develop an algorithm to handle collisions using quadratic probing. Show an example of key insertion and table scanning.	III	4	6M
		Unit-V			
5	a	i) Describe quicksort. Explain the working of partitioning in quicksort with a simple example.	II	5	6M
		ii) Explain the concept of AVL trees. Describe how rotations maintain balance in AVL trees.	II	5	6M
		OR			
	b	Construct a binary search tree using a given sequence of keys. Show insertion step-by-step. Keys: 50,25,15,35,75,65,85. Then delete the keys 75 and 15.	III	5	12M

KL: Bloom's Taxonomy Knowledge Level CO: Course Outcome M: Marks

NARASARAOPETA ENGINEERING COLLEGE
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I MCA I Semester Regular & Supple. Examinations, December-2025 **R24**

Sub Code: R24MCA102 **COMPUTER ORGANIZATION**

Time: 3 hours Max. Marks: 60

Note: Answer All FIVE Questions. All Questions Carry Equal Marks (5 X 12M = 60M)

Q.No		Questions	KL	CO	M
1		Unit-I			
	a	i)Explain all the functional units of a computer with neat diagram.	4	1	6M
		ii) Distinguish between CISC and RISC instruction set.	4	1	6M
		OR			
	b	i) Articulate different generations of computers.	3	1	8M
		ii) Distinguish between multiprocessors and multicomputers.	4	1	4M
2		Unit-II			
	a	i) Perform 1's complement and 2'complement arithmetic on $-25_{(10)}$ and $-67_{(10)}$.	3	2	6M
		ii)Determine different status codes present in Status register.	3	2	6M
		OR			
	b	i) Explain all the addressing modes in detail with examples.	4	2	8M
		ii)Interpret the meaning of any four assembler directives.	2	2	4M
3		Unit-III			
	a	i) Explain Vectored interrupts and Interrupt Nesting.	4	3	6M
		ii)Infer the ARM Interrupt structure.	2	3	6M
		OR			
	b	i)Explain Direct Memory Access Data transmission in detail with neat diagram.	4	3	8M
		ii)Explain Asynchronous bus with neat diagram.	4	3	4M
4		Unit-IV			
	a	i) Interpret different cache memory mapping techniques.	2	4	8M
		ii) Explain what is the use of memory controller.	4	4	4M
		OR			
	b	i)Explain Virtual memory address translation.	4	4	8M
		ii)Present different secondary storage devices with neat diagrams.	2	4	4M
5		Unit-V			
	a	i)Summarize the classification of parallel structures.	2	5	4M
		ii) Explain instruction pipeline with neat diagrams.	4	5	8M
		OR			
	b	i)Explain Arithmetic pipeline with neat diagrams.	4	5	8M
		ii) Write short note on Multiprocessors.	2	5	6M

KL: Blooms Taxonomy Knowledge Level CO: Course Outcome M:Marks

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NARASARAOPETA
NEC ENGINEERING COLLEGE
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I MCA I Semester Regular & Supple. Examinations, December-2025

Sub Code: R24MCA103 DATABASE MANAGEMENT SYSTEM

Time: 3 hours Max. Marks: 60

Note: Answer All FIVE Questions. All Questions Carry Equal Marks (5 X 12M = 60M)

Q.No		Questions	KL	CO	
		Unit-I			
1	a	i) Discuss the significance of the view of data in database systems. How do different levels of abstraction (physical, logical, and view levels) contribute to system efficiency?	K2	1	6
		ii) Illustrate with examples how constraints like cardinality and participation influence the design of relationships in the ER model.	K4	1	6
		OR			
	b	i) Differentiate between the roles of a database administrator (DBA) and a database user. Why is the DBA critical for an organization?	K2	1	6M
		ii) What is the role of extended ER features like specialization and generalization in database design? Provide examples.	K4	1	6M
		Unit-II			
2	a	i) How can integrity constraints be enforced in a relational database? Provide examples of enforcement techniques for each type of constraint.	K3	2	6M
		ii) Explain the differences between tuple relational calculus and domain relational calculus. Provide examples to illustrate how queries are written in each.	K3	2	6M
		OR			
	b	i) Describe the process of converting an ER diagram to a relational schema. Provide a step-by-step example with entities and relationships.	K4	2	6M
		ii) Discuss the division operation in relational algebra. Provide a real-world example where this operation is useful, and explain its result.	K3	2	6M
		Unit-III			
3	a	i) Write an SQL query to demonstrate the use of nested queries. Include an example of a correlated subquery and explain its execution.	K3	3	6M
		ii) Explain the concept of exceptions in SQL. Provide an example of an exception handler in a PL/SQL block and explain its usage.	K3	3	6M
		OR			
	b	i) Explain the parts of a trigger in SQL. Write an example of a trigger to enforce a complex integrity constraint and explain its working.	K3	3	6M
		ii) Explain the differences between BCNF and 3NF with examples. Under what conditions would a relation in 3NF fail to be in BCNF?	K4	3	6M
		Unit-IV			
4	a	i) Explain the importance of lossless join decomposition. How does it ensure that no information is lost during normalization? Provide an example.	K4	4	6M
		ii) Describe the process of granting locks in databases. Provide examples of scenarios where lock granting may lead to deadlocks.	K2	4	6M
		OR			
	b	i) Define serializability and explain its types (conflict and view serializability) with examples. What are its advantages in concurrent execution?	K2	4	6M

		ii) Discuss the Thomas Write Rule. Explain how it optimizes based protocol with an example.		
5		Unit-V		
	a	i) Discuss the trade-offs between file organizations and indexing techniques. How do they affect query processing efficiency?	K4	5
		ii) Explain the structure of B+ trees. How do they differ from binary search trees and ISAM?	K4	5
		OR		
	b	i) Explain the role of tree-based indexing in databases. Discuss scenarios where tree-based indexing is more suitable than hash-based indexing.	K4	5
		ii) Discuss how duplicates are handled in B+ trees. Provide examples showing different techniques for managing duplicate values.	K4	5

KL: Blooms Taxonomy Knowledge Level CO: Course Outcome M:Marks

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NEC ENGINEERING COLLEGE
(AUTONOMOUS)

I MCA I Semester Regular & Supple. Examinations, December-2025

Sub Code: R24MCA104 **OPERATING SYSTEM**

Time: 3 hours Max. Marks: 60

Note: Answer All FIVE Questions. All Questions Carry Equal Marks (5 X 12M = 60M)

Q.No		Questions	KL	CO	M
1		Unit-I			
	a	i)What are the three main purposes of an Operating System	2	1	6M
		ii)Explain the various types of system calls with an example for each	2	1	6M
		OR			
	b	i) Explain the various structure of an Operating system	2	1	6M
		ii) What are the various Operating system services. Write about them in detail	2	1	6M
2		Unit-II			
	a	i)Explain why interrupts are not appropriate for implementing synchronous primitives in multiprocessor systems	2	2	6M
		ii)Compute the average computing time for the processes using Non-preemptive SJF scheduling algorithm	3	2	6M
		OR			
	b	i) Write in detail about FCFS algorithm	3	2	6M
		ii)Write shot notes on SJF and RR algorithms	3	2	6M
3		Unit-III			
	a	i) Explain Deadlock detection	2	3	6M
		ii)How a system can recover from deadlock	2	3	6M
		OR			
	b	i) Explain the Dining Philosophers critical section problem solution using monitor	3	3	6M
		ii)Explain multilevel queue and multilevel feedback queue scheduling with suitable examples	3	3	6M
4		Unit-IV			
	a	i)Explain about Memory management techniques and contiguous memory allocation	2	4	6M
		ii)What is a file. List the various file attributes and operations	2	4	6M
		OR			
	b	i)Explain in detail about Paging with TLB	2	4	6M
		ii)Explain about the importance of Disk scheduling in OS	2	4	6M
5		Unit-V			
	a	i)Explain the design principles of Linux system	3	5	6M
		ii)What are the Terminal services provided by Windows7	2	5	6M
		OR			
	b	i)Write a shot notes on Intercrosses communication	2	5	6M
		ii)Explain the design principles of Windows7	2	5	6M

Process	Arrival Time	Burst Time
P1	0	7
P2	2	4
P3	4	1
P4	5	4
P5	3	4

KL: Blooms Taxonomy Knowledge Level CO: Course Outcome M:Marks

NARASARAOPETA ENGINEERING COLLEGE
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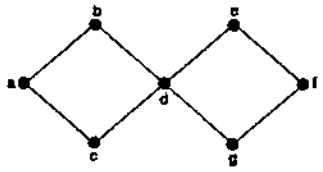
I MCA I Semester Regular & Supple. Examinations, December-2025 | **R24**

Sub Code: R24MCA101 MATHEMATICAL & STATISTICAL FOUNDATIONS

Time: 3 hours Max. Marks: 60

Note: Answer All FIVE Questions. All Questions Carry Equal Marks (5 X 12M = 60M)

Q.No		Questions	KL	CO	M
		Unit-I			
1	a	i) In a certain group of engineers 60% have insufficient background of information theory, 50% have inadequate knowledge of probability and 80% are in either one or both of two adequate categories. What is the percentage of people who have adequate knowledge of probability among those who have a sufficient background of information theory?	3	1	6M
		ii) A random variable X has the following probability function: X: 0, 1, 2, 3, 4 P(x): k, 3k, 5k, 7k, 9k Find (i) the value of k; (ii) $P(X < 3)$ and $P(0 < X < 4)$; and (iii) the distribution function of X.	3	1	6M
		OR			
	b	i) A bag contains 5 balls and it is not known how many of them are white. Two balls are drawn at random from the bag and they are noted to be white. What is the chance that all the balls in the bag are white?	3	1	6M
		ii) If a random variable X has the probability function $f(x)=\begin{cases}\frac{1}{4}, & \lvert x\rvert<2\\ 0, & otherwise\end{cases}$, find (i) $P(X < 1)$; (ii) $P(\lvert X\rvert > 1)$; and (iii) $P(2X + 3 > 5)$	3	1	6M
		Unit-II			
2	a	i) A prototype automotive tire has a design life of 38,500 miles with a standard deviation of 2,500 miles. Five such tires are manufactured and tested. On the assumption that the actual population mean is 38,500 miles and the actual population standard deviation is 2,500 miles, find the probability that the sample mean will be less than 36,000 miles. Assume that the distribution of lifetimes of such tires is normal.	3	2	6M
		ii) A sample of 25 test scores has a mean of the 78 and a standard deviation of the 8. Construct a 95% confidence interval for the population mean.	3	2	6M
		OR			
	b	i) Calculate the variance of following data Class intervals: 200-201, 201-202, 202-203, 203-204, 204-205, 205-206 Frequency: 13, 27, 18, 10, 1, 1	3	2	6M
		ii) A random sample x_1, x_2, x_3, x_4, x_5 of size 5 is drawn from a normal distribution with unknown mean μ. Consider the following estimators to estimate μ: $t_1=\frac{x_1+x_2+x_3+x_4+x_5}{5}$; $t_2=\frac{x_1+x_2}{2}+x_3$; $t_3=\frac{2x_1+x_2+\lambda x_3}{4}$ Where is such that t_3 is an unbiased estimator of μ. Find . Check whether t_1, t_2 are unbiased or not?	3	2	6M

3		Unit-III			
	a	i) A fertilizer mixing machine is set to give 12 kg of nitrate for every quintal bag of fertilizer. Ten 100 kg bags are examined. The percentages of nitrate are as follows: 11, 14, 13, 12, 13, 12, 13, 14, 11, 12. Is there reason to believe that the machine is defective? Value of t for 9 degrees of freedom is 2.262.	3	3	6M
		ii) A study shows that 16 out of 200 tractors produced on one assembly line required extensive adjustments before they could be shipped, while the same was true for 14 out of 400 tractors produced on another assembly line. At the 0.01 level of significance, does this support the claim that the second production line does support work?	3	3	6M
		OR			
	b	i) From experience, it was recorded that certain workers who underwent a training emerged out as the 1st, 2nd, 3rd, 4th grade workers and their number were in the ratio 9 : 3 : 3 : 1. In a current set of 556 such workers the respective graded persons were 315, 101, 108, 32. Use Chi-square test to find whether the observed values are commensurable to the recorded values.	3	3	6M
		ii) To test the claim that the resistance of electric wire can be reduced by more than 0.050 ohm by alloying, 32 values obtained for standard curve yielded $\overline{x_1} = 0.136$ ohm and $S_1 = 0.004$ ohm and 32 values obtained for alloyed $\overline{x_2} = 0.083$ and $S_2 = 0.005$ ohm. At the 0.05 level of significance, does this support the claim?	3	3	6M
4		Unit-IV			
	a	i) i) Consider the group G = {1, 2, 3, 4, 5, 6} under multiplication modulo 7. Write (i) the multiplication table of G; (ii) Find the inverses of each element of G.	3	4	6M
		ii) Solve 3^{100} mod 29.	3	4	6M
		OR			
	b	If (G, .) is a group such that $(ab)^n = a^n b^n$ for three consecutive integers, then show that ab = ba.	3	4	6M
		ii)Define Group and write it's properties.	3	4	6M
5		Unit-V			
	a	i) Determine the number of edges in a graph with 6 vertices, 2 of degree 4 and 4 of degree 2. Draw two such graphs.	3	5	6M
		ii) Use BFS algorithm to find a spanning tree of the following graph 	3	5	6M
		OR			
	b	i) Give an example for each of the following graphs: (i) both Euler and Hamiltonian (ii) Euler but not Hamiltonian (iii) Hamiltonian but not Euler (iv) neither Euler nor Hamiltonian.	3	5	6M
		ii) A connected planar graph has 10 vertices each of degree 3. Into how many regions, does a representation of this planar graph split the plane?	3	5	6M

KL: Blooms Taxonomy Knowledge Level CO: Course Outcome M:Marks