



MCA DEGREE EXAMINATIONS: JUNE 2018

(Regulation 2017)

Second Semester

MASTER OF COMPUTER APPLICATIONS

P17CAT2101: Data Structures

COURSE OUTCOMES

- CO1:** Understand the behavior of basic data structures.
CO2: Analyze time and space complexity of elementary algorithms.
CO3: Interpret a problem and determine the appropriate data structure for the problem.
CO4: Understand the efficient storage mechanism to facilitate easy data access.
CO5: Improves the logical thinking ability.

Time: Three Hours

Maximum Marks: 100

**Answer all the Questions:-
PART A (10 x 1 = 10 Marks)**

1. Match list I (Data Structure) with list II (Application) and select the correct answer using the codes given below. CO3 [K₂]

List I	List II
A. Stack	i. Addition of Polynomials
B. Arrays	ii. Single source shortest path
C. Queue	iii. Recursion
D. Graph	iv. Job Scheduling

- | | | | | |
|----|-----|----|-----|----|
| | A | B | C | D |
| a) | ii | i | iii | iv |
| b) | iii | iv | ii | i |
| c) | ii | iv | iii | i |
| d) | iii | i | iv | Ii |

2. The worst case time complexity of a sequential search algorithm is _____. CO2 [K₄]
- | | | | |
|----|----------|----|--------------------|
| a) | O(1) | b) | O(n) |
| c) | O(log n) | d) | O(n ²) |

3. Consider the following scenario – CO3 [K₄]
1. The five items: P, Q, R, S and T are inserted to stack A one after other from T in reverse order.
 2. The stack is popped three times and each element is inserted into another stack B.
 3. Then two elements are deleted from the stack B and pushed back onto stack A.
- What are the topmost elements of stack A and stack B respectively?
- a) RP b) RQ
 c) QP d) QR
4. Suppose you have the following series of queue operations: CO4 [K₃]
 q = Queue(), q.enqueue('hello'), q.enqueue('dog'), q.enqueue(3), q.dequeue()
- What items are left on the queue?
- a) 'hello', 'dog' b) 'dog', 3
 c) 'hello', 3 d) 'hello', 'dog', 3
5. Assertion (A): A tree is defined to be a connected acyclic graph. CO2 [K₄]
 Reason (R): The tree structure ensures that no set of nodes link together to form a closed loop or a cycle.
- a) Both A and R are Individually true and R is the correct explanation of A b) Both A and R are Individually true but R is not the correct explanation of A
 c) A is true but R is false d) A is false but R is true
6. The following numbers are inserted into an empty binary search tree in the given order: 10, 1, 3, 5, 15, 12, 16. What is the height of the binary search tree (the height is the maximum distance of a leaf node from the root)? CO1 [K₃]
- a) 2 b) 3
 c) 4 d) 6
7. The concatenation of two lists is to be performed in O(1) time. Which of the following implementations of a list should be used? CO3 [K₂]
- (A) singly linked list
 (B) doubly linked list
 (C) circular doubly linked list
 (D) array implementation of lists
- a) A and B only b) B only
 c) C only d) A and D only
8. For the following array B, CO4 [K₃]
 Column index: 0:5 Base address: 1003 Row index: 0:15
 the address of B[7,2] is _____.

- a) 1047
- b) 1053
- c) 1003
- d) 1010

9. Assertion (A): In an AVL tree, the heights of the two child subtrees of any node differ by at most one. CO1 [K₄]

Reason (R): AVL trees are known as height balanced trees.

- a) Both A and R are Individually true and R is the correct explanation of A
- b) Both A and R are Individually true but R is not the correct explanation of A
- c) A is true but R is false
- d) A is false but R is true

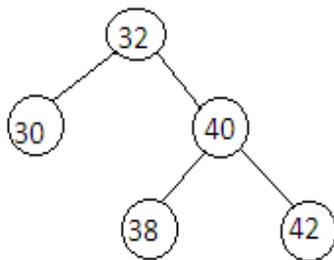
10. The following sequence of operation is performed on stack : push(1), push(2), pop, push(1), push(2), pop, pop, pop, push(2), pop. CO4 [K₃]

The sequence of popped out values are _____ .

- a) 2,2,1,1,2
- b) 2,2,1,2,2
- c) 2,1,2,2,1
- d) 2,1,2,2,2

PART B (10 x 2 = 20 Marks)
(Answer not more than 40 words)

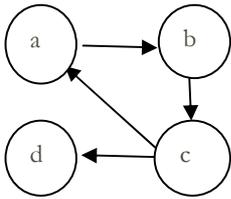
- 11. Define Big Oh (O) notation. CO2 [K₂]
- 12. List out the two kinds of efficiency. CO4 [K₁]
- 13. Differentiate between the row major and column major representation of arrays. CO1 [K₂]
- 14. Justify why Sparse Matrix can be used instead of a simple matrix. CO3 [K₅]
- 15. Compare circularly linked list with singly linked list. CO4 [K₄]
- 16. Outline the test condition to check whether the stack is full or not. CO1 [K₂]
- 17. Define Deque with a neat diagram. CO1 [K₁]
- 18. In the following AVL tree, after inserting 48, which operation has to be performed to maintain the AVL property? CO4 [K₅]



Draw the AVL tree after insertion.

19. For the following digraph write the adjacency matrix.

CO3 [K₃]



20. Cist any two applications of graphs.

CO5 [K₂]

**Answer any FIVE Questions:-
PART C (5 x 14 = 70 Marks)
(Answer not more than 350 words)**

Q.No. 21 is Compulsory

21. a) Construct a binary search tree for the given data : 84, 79, 11, 56, 44, 16, 123, 76, 99, 25, 34. (6) CO3 [K₅]

b) Explain the operations of stack and illustrate with an example. (8) CO1 [K₂]

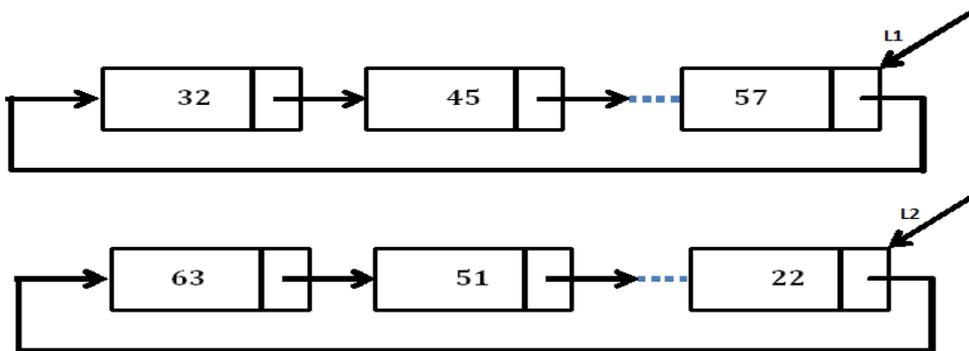
22. a) Demonstrate the applications of array for the addition of two polynomials P1 and P2 given below with an algorithm:

$$P1 : 2x^3 - 10x^2 + 15$$

$$P2 : 3x^2 + 6x + 2.$$

b) Apply the algorithm to evaluate postfix expression to convert the expression ((A + B) * C - (D - E) ^ (F + G)) to an equivalent Postfix expression. (8) CO4 [K₃]

23. a) Given two circularly linked list L1 and L2, write an algorithm to concatenate the two lists into a single list and explain the steps. (6) CO5 [K₅]



b) Explain the algorithm to insert an element in a doubly linked list and illustrate with an example. (8) CO3 [K₄]

24. a) Illustrate the algorithm for implementation of delete operation on a queue using arrays. (6) CO4 [K₃]
b) Explain the different types of queues with example. (8) CO1 [K₂]
25. a) Explain binary tree representation with an example. (6) CO2 [K₂]
b) Illustrate the binary tree Inorder traversal algorithm with a suitable example. (8) CO3 [K₃]
26. a) Write and explain Warshall's algorithm. (6) CO3 [K₂]
b) Apply Dijkstra's algorithm for the following graph to find the shortest path. (8) CO5 [K₃]

