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Reg. No. :

Code No. : 8381

Sub. Code : WCAM 21

M.C.A. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2024.

Second Semester

Computer Applications – Core

DATA STRUCTURE AND ALGORITHMS

(For those who joined in July 2023 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (15 × 1 = 15 marks)

Answer ALL questions.

Choose the correct answer :

1. The _____ is an object that provides a mechanism for performing generic traversals.
(a) Iterator (b) Date
(c) ADT (d) Bag
2. Which one returns the value stored in the array at element position index?
(a) setitem() (b) getitem()
(c) length() (d) clearing()

3. In a multidimensional array, the number of dimensions must be _____.
(a) 0 (b) 1
(c) 2 (d) 3
4. Which analysis is used to define a probability distribution on the set of inputs?
(a) best case (b) average case
(c) worse case (d) time-space
5. A function call by itself is called as _____.
(a) procedure (b) call function
(c) recursion (d) function
6. Which one of the sequence is in correct order?
(a) $1, n \log n, \log n, n, n^2, n^3, 2^n$
(b) $n^2, n^3, 2^n, 1, \log n, n, n \log n$
(c) $\log n, n, n \log n, n^2, n^3, 2^n, 1$
(d) $1, \log n, n, n \log n, n^2, n^3, 2^n$
7. Find out the working principle of queue data structure.
(a) LIFO (b) FIFO
(c) FIFI (d) LIFI

8. Which function is NOT available in stack?
- (a) PUSH (b) POP
(c) PEEP (d) DELETE
9. The last node of a linked list is known as _____.
- (a) FIRST (b) LAST
(c) head (d) tail
10. The running time of min operation in priority queue is _____
- (a) n^2 (b) $n \log n$
(c) $\log(n)$ (d) $O(n)$
11. Which data structure is more efficient for implementing the map?
- (a) stack (b) queue
(c) hash (d) heap
12. A _____ is a set-like container that allows duplicates.
- (a) hash (b) set
(c) multisets (d) multimaps

13. If the internal nodes of a tree may have more than two children, then they are called as _____
- (a) multiway search tree
(b) binary search tree
(c) tree traversal
(d) height of the tree
14. The worst case complexity of merge sort is _____
- (a) $O(n)$ (b) $O(n \log n)$
(c) $O(n^2)$ (d) $O(2n)$
15. A _____ is a systematic procedure for exploring a graph by examining all of its vertices and edges.
- (a) traversal (b) iteration
(c) cycle (d) rank

PART B — (5 × 4 = 20 marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 250 words.

16. (a) Categorize the functions of Date ADT.
- Or
- (b) How will you design an iterator?

17. (a) Illustrate the working of ceiling and floor functions.

Or

- (b) Demonstrate the working of multiple recursion with an example.

18. (a) Categorize the operations of the queue.

Or

- (b) Categorize the type of lists.

19. (a) Interpret the usage of sorted maps.

Or

- (b) Identify the need for multisets.

20. (a) Insert into an empty binary search tree, the entries with keys 30, 40, 24, 58, 48, 26, 11, 13 (in this order). Draw the tree after each insertion.

Or

- (b) Illustrate the working of the merge sort algorithm.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b)
Each answer should not exceed 600 words.

21. (a) How will you use the map ADT? Explain with an example.

Or

- (b) Demonstrate the working of a multidimensional array.

22. (a) Categorize the seven functions for performing algorithm analysis.

Or

- (b) How will you perform asymptotic analysis to measure the efficiency of an algorithm?

23. (a) Demonstrate the working procedure of doubly linked lists.

Or

- (b) Illustrate the working procedure of the binary tree algorithm.

24. (a) How will you implement the priority queue algorithm with a heap data structure?

Or

(b) How will you implement the application of counting word frequencies using Map?

25. (a) Demonstrate the Breadth-first algorithm for a graph.

Or

(b) Illustrate the working principle of AVL trees.
