

Jharkhand University of Technology, Ranchi**B.Tech. 3rd Semester Examination, 2019****Subject : Data Structures and Algorithms****Subject Code : CS-301****Time Allowed : 3 Hours****Full Marks : 70**

Candidates are required to give their answer in their own words as far as practicable.

The figures in the right margin indicate full marks.

Answer any five questions.

1. There are SEVEN objective type questions and each carries two marks. Select the correct answer:
2×7=14

(a) Assume elements of lower triangular matrix $A_{m \times m}$ are stored in one dimension array representation whose base address is B_0 number of memory location required for an element is W . If storing takes place in row major where elements of the row one are stored first then which of the following is true for calculating the address of element $A(i, j)$.

(i) $B_0 + \left[\frac{i(i-1)}{2} + j \right] \times W$ (ii) $B_0 + \left[\frac{i(i-1)}{2} + j - 1 \right] \times W$

(iii) $B_0 + \left[\frac{i(i-1)}{2} + j + 1 \right] \times W$ (iv) $B_0 + \left[\frac{j(j-1)}{2} + i \right] \times W$

(b) For merging two unsorted list of size p and q into sorted list of size $(p + q)$. The time complexity in terms of number of comparison is:

(i) $O(\log p + \log q)$ (ii) $O(p + q)$

(iii) $O(p \log p + q \log q)$ (iv) None

(c) Linked lists are not suitable data structures of which one of the following problems?

(i) Insertion sort (ii) Binary search

(iii) Radix sort (iv) Polynomial manipulation

(d) Which one of the following correctly determines the solution of the recurrent relation given below with $T(1) = 1$? $T(n) = 2T\left(\frac{n}{4}\right) + n^{1/2}$

(i) $O(n^2)$ (ii) $O(n)$

(iii) $O(n^2 \log n)$ (iv) $O(\log n)$

(e) In the worst case, the number of comparisons needed to search a singly linked list of length n for a given element is

(i) $\log_2 n$ (ii) $n/2$

(iii) $\log_2 n - 1$ (iv) n

7. (a) What is Hashing and re-hashing? Consider a Hash table with nine slots. The hash function is $h(k) = k \bmod 9$. The collisions are resolved by chaining. The following nine keys are inserted in the order: 5, 28, 19, 15, 20, 33, 12, 17 and 10. Find the maximum, minimum and average chain lengths in the hash table. 7
- (b) Write the BFS traversal for the given graph in Fig. 2. Start with the vertex A and show the addition of each vertex with appropriate data structures. 7

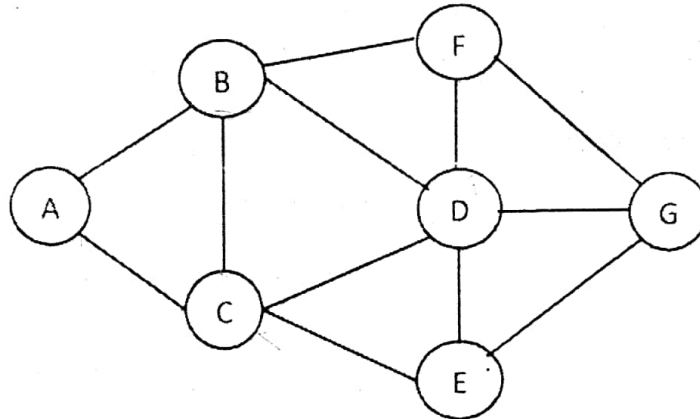


Figure 2

8. Write short notes on the *any two*:

7×2=14

- (a) Dijkstra Algorithm
- (b) Floyd's Warshall Algorithm
- (c) Collision Resolution in Hashing
- (d) Dangling reference