BRAINWARE UNIVERSITY

Course – B.Sc.(CS)

Data Structure and Algorithm (BCS202 / BCSC202)

(Semester – 2)

Time allotted: 3 Hours **Full Marks : 70**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group –A

(Multiple Choice Type Questions) 10 x 1 = 10

1. *Choose the correct alternative from the following*

(i) The complexity of binary search algorithm is

a. O(n) b. $O(\log_2 n)$

c. $O(n \log_2 n)$ d. $O(n^2)$

(ii) Sparse matrix is

a. all 0 element matrix b. a unit matrix

c. mostly 0 element matrix d. a few 0 element matrix.

(iii) The prefix expression for infix expression a * (b + c) / e - f

a. /*a+bc-ef b. -/*+abcef

c. -/*a+bcef d. None of these

(iv) How many different binary trees are possible with 4 nodes ?

a. 17 b. 14

c. 24 d. None of these

(v) Maximum possible height of an AVL tree with 7 nodes is

a. 4 b. 3

c. 5 d. None of these

(vi) Which of the following is a linear data-structure?

a. Graph b. Binary Search Tree

c. Double Linked-List d. None of these

(vii) The preorder and postorder traversal of a binary tree generate the same output. The tree can have maximum

a. three nodes b. two nodes

c. one node d. any number of nodes

(viii) What is the worst case runtime complexity of search for binary search tree algorithm?

a. $O(\log_2 n)$ b. $O(n \log_2 n)$

c. O(n) d. None of these

(ix) The following sequence of operation is performed on stack : push(1), push(2), pop, push(1), push(2), pop, pop, pop, push(2), pop.The sequence of popped out values are ?

a. 2,2,1,1,2 b. 2,2,1,2,1

c. 2,1,2,2,1 d. 1,1,2,2,2

(x) Minimum number of multiplication needed for computation of x^8 is

a. 4 b. 6

c. 5 d. 3

Group – B

(Short Answer Type Questions) 3 x 5 = 15

Answer any *three* from the following

2. Write an algorithm or C code to insert an element into a circular queue. [5]

3. Compare and contrast between array and linked list. [5]

4. Define Hashing? Write different types of Hashing function. [5]

5. Write an algorithm or C code to insert an element at the end of a singly linked list. [5]

6. T(n) = n +T(n/2) where T(1)=1 . Express T(n) in order expression. [5]

Group – C

(Long Answer Type Questions) 3 x 15 = 45

Answer any *three* from the following

7. (a) Write an algorithm or C code to implement merge sort. [8]

   (b) Convert the following infix expression into equivalent postfix expression using stack [5]
   A + (B * C – (D / E ^ F) * G) * H (where x^y means x^y).

   (c) Define full binary tree with a suitable example. [2]

8. (a) Define binary tree with an example, [2]

   (b) Create a binary search tree with the following key values 25, 17, 60, 35, 20, 10, 15, 8, 27, 65, 12, 30. Now delete key 25 and draw the tree. [4+2]

   (c) Create an AVL tree with the following values [5]
   A, V, X, C, T, B, Y, S.

   (d) What are the advantages of threaded binary tree? [2]

9. (a) What are the different applications of Stack and Queue? [3]

   (b) Evaluate the following postfix notation using stack, 8 5 9 * + 6 3 / -. [5]

   (c) Write an algorithm or C code to implement insert and delete operation using linked list on stack. [7]

10. (a) Define max- heap. Create a max-heap with following elements. [4]
40, 80, 100, 10, 30, 70, 20, 50, 60, 90.

(b) Draw the binary tree corresponding to the following traversal sequence: [4]
In-order : G D I B E J A C F
Pre-order : A B D G I E J C F

(c) Draw an expression tree from the following expression [3]
(a - b - c) * (d / e + f) - g + h.

(d) Draw a B-tree of order 3 with the following nodes [4]
5, 3, 21, 9, 1, 13, 2, 7, 10, 12, 4, 8.

11. (a) Write an algorithm or C code for binary search and calculate the complexity for worst cases. [5]

(b) Explain with a suitable example the collision resolution scheme using linear probing with open addressing. [5]

(c) Write short note on abstract data type. [5]
