2010

Time: 3 hours

Full Marks: 80

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

The figures in the margin indicate full marks.

Answer from both the Groups as directed.

Group – A

(Compulsory)

1. Choose the correct answer of the following:

\[ 2 \times 10 = 20 \]

(a) Time complexity of insertion sort algorithm in the best case is:

(i) \( O(n) \)

(ii) \( O(n \log_2 n) \)

SB - 25/3

(Turn over)
(iii) \(O(n^2)\)
(iv) None of the above

(b) The prefix expression for the infix expression \(a\times(b+c)/e-f\) is:
(i) \(^*/a+bc-ef\)
(ii) \(=/a+abc\,ef\)
(iii) \(=/a+boef\)
(iv) None of the above

(c) The smallest number of keys that will force a B-Tree of order 3 to have a height 3 is:
(i) 12
(ii) 10
(iii) 7
(iv) None of the above

(d) The following sequence of operations is performed on a stack: push(1), push(2), pop, push(1), push(2), pop, pop, pop, push(2), pop. The sequences of popped out values are:
(i) 2, 2, 1, 2, 1
(ii) 2, 2, 1, 1, 2

SB – 25/3  (2) Contd.
(iii) 2, 1, 2, 2, 1
(iv) 2, 1, 2, 2, 2

(e) Depth first traversal of a graph produces:
   (i) A spanning tree of the graph
   (ii) A spanning forest of the graph
   (iii) A minimal spanning tree
   (iv) None of the above

(f) Which of the following statements is true?
   (i) A binary tree is always a heap
   (ii) A heap is a full binary tree
   (iii) A heap is a complete binary tree
   (iv) Root of the heap is always the smallest element in the heap

(g) The property of hash function is that:
   (i) It minimizes the rate of overflow
   (ii) It preserves the order of key values
   (iii) It minimizes number of collisions
   (iv) None of the above

SB – 25/3 (3) (Turn over)
Group – B

Answer any four questions:

2. (a) Write a “C” function to copy one stack to another assuming the stack is implemented using array. 8
(b) Write an algorithm to evaluate Postfix expression with the help of a stack. 7

3. (a) What is Circular link list? Write an algorithm for inserting a node at the front. 8
(b) What is a spanning tree? What do you mean by minimal spanning tree? 7

4. (a) Write down the iterative algorithm for in-order traversal of a binary tree. 8
(b) What is a binary tree? Write down different properties of a binary tree. 7

5. (a) What is hashing? Give the characteristics of hash function. 8
(b) What are the different methods of handling overflow in hashing? 7

SB – 25/3 (5) (Turn over)
6. (a) Create a B-tree of order 5, when the keys arrive in the following order:
   a, f, g, b, k, d, m, j, e, s, i, x, r, y, c
   
   (b) Create a binary search tree when the elements arrive in the following order:
   10, 5, 20, 7, 29, 11, 23, 29, 13, 12

7. (a) Write an algorithm to implement merge sort with n elements. Explain with an example.

   (b) What are the differences between internal sorting and external sorting? When is a sorting technique said to be stable?

8. (a) Compare and contrast: DFS and BFS (Breadth First Search) with examples of each.

   (b) What is Stack? Implement its PUSH() and POP() functions with the help of link list method.

9. (a) Explain Queue. Define the queue with the help of array implementation.

SB - 25/3 (6) Contd.
(b) Write an algorithm to insert an element at desired position in the doubly link list. 7

10. (a) What do you mean by Threaded Binary Tree? Explain it with example. 8

(b) Construct the binary tree with the help of following given nodes and write the sequence of all traversal methods of the given nodes:

80, 12, 100, 15, 350, 400, 5, 70, 75, 450