Total No. of Questions: 8]

SEAT No. :

**PA-1239**

[Total No. of Pages : 3]

**[5925]-261**

## S.E. (Computer Engineering)
## DATA STRUCTURES AND ALGORITHMS
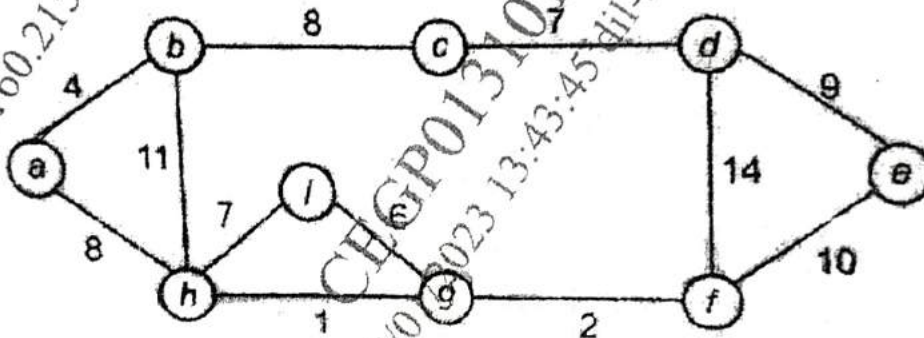### (2019 Pattern) (Semester-IV) (210252)

*Time : 2½ Hours]*

*[Max. Marks : 70*

*Instructions to the candidates:*

1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right indicate full marks.*
4) *Assume suitable data, if necessary.*

**Q1)** a) Find minimum spanning tree of the following graph using kruskals algorithm. **[6]**



b) Write algorithm for Breadth First Traversal of the graph. Also write its complexity. **[6]**

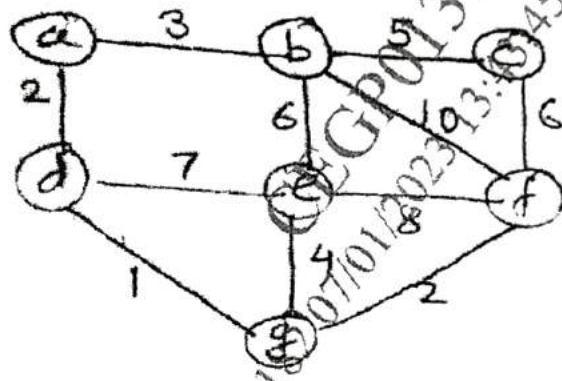c) Write Kruskal's algorithm for minimum spanning trees and explain with example. **[6]**

**OR**

*P.T.O.*

**Q2) a)** Apply Prim's Algorithm to construct Minimum Spanning Tree, for below drawn graph: Starting vertex is 'a'. **[6]**
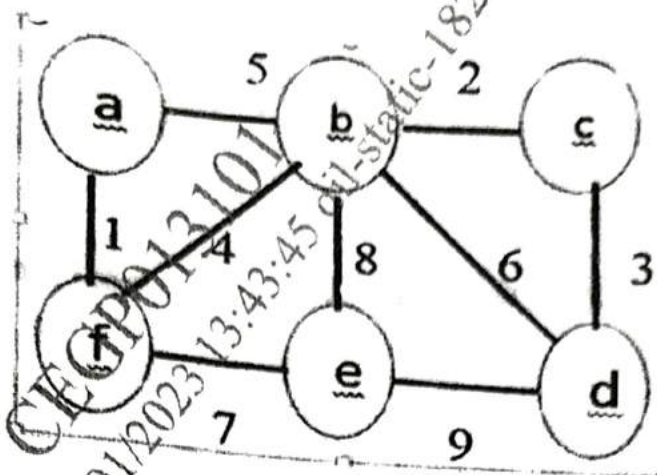


**b)** Develop pseudo code with one example to traverse a graph using BFS. **[6]**

**c)** Find the shortest path from a to f, in the following graph using Dijkstra's Algorithm. **[6]**



**Q3) a)** What is OBST? List binary search tree with 3 words (w1, w2, w3) = (do, if, stop) words occurs with probabilities (P1, P2, p3) = (0.4, 0.5, 0.1) find expected access time in each case. **[6]**

**b)** Build AVL tree for given sequence of data. Show balance factor of all nodes and name the rotation used for balancing the tree 40,60,80,50,45,47,44,42,75,46,41. **[6]**

**c)** Write short notes on: **[5]**
   i) Red Black tree
   ii) Splay tree

OR

**Q4) a)** Construct OBST for given data using dynamic programming approach. Explain stepwise. **[6]**

| Index | 0 | 1 | 2 | 3 |
|-------|-----|-----|-----|-----|
| Data | 10 | 20 | 30 | 40 |
| Frequency | 4 | 2 | 6 | 3 |

**b)** Demonstrate Deletion Operation in AVL with example. **[6]**

**c)** Explain following terms w.r.t. height balance tree LL, RR, LR, RL. **[5]**

**Q5) a)** Construct B-tree of order 4 by inserting the following data one at a time. 20, 10, 30, 15, 12, 40, 50 **[6]**

**b)** Write an algorithm to insert a node in B Tree. **[6]**

**c)** Construct the B+ Tree of order 4 for the following data: 1, 4, 7, 10, 17, 21, 31, 25, 19, 20, 28, 42. **[6]**

### OR

**Q6) a)** Build B+ tree of order 3 for the following: 1, 42, 38, 21, 31, 10, 17, 7, 31, 25, 20, 18. **[6]**

**b)** Write an algorithm to delete a node from B+tree. **[6]**

**c)** Insert the keys to a 5-way B-tree: 3, 7, 9, 23, 45, 1, 5, 14, 25, 24, 13, 11, 08, 19, 04, 31, 35, 56 **[6]**

**Q7) a)** Write short notes on: **[6]**
  i) Factors affecting the file organization
  ii) Indexed sequential files
  iii) Indexing techniques

**b)** Compare sequential, indexed sequential and direct access files. **[6]**

**c)** Explain any 4 modes of opening the file in C or C++. **[5]**

### OR

**Q8) a)** Explain following operations carried out on sequential files. **[6]**
  i) Add
  ii) Delete
  iii) Search

**b)** Explain any 3 operations carried out on sequentail file and its pseudo code. **[6]**

**c)** A file of employees records, has 'employee no' as primary key and the 'department code' and the 'designation code' as the secondary keys. Write a procedure to answer the following query – 'Which employees from systems department are above designation level 4? **[5]**