

Duration: 3hrs

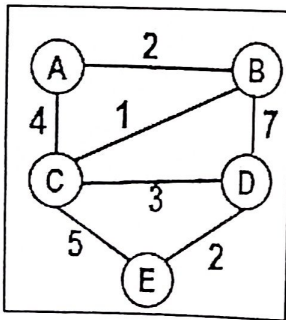
[Max Marks: 80]

- N.B.: (1) Question No 1 is Compulsory.
 (2) Attempt any three questions out of the remaining five.
 (3) All questions carry equal marks.
 (4) Assume suitable data, if required and state it clearly.

- 1 Attempt any FOUR
- a Classify the following as linear or nonlinear data structures and give one real-life example for each: Array, Stack, Queue, Binary Tree. [20]
 - b Differentiate between Stack and Queue data structure.. [5]
 - c Define the term Node, Address, Null pointer, Next and Empty list for linked list. [5]
 - d Explain Graph representation techniques with example. [5]
 - e Explain the working of a circular queue with its advantages over a linear queue. [5]
- 2
- a Explain how element 6 can be searched in the given array using binary search algorithm. Write algorithm for the same: 5,9,11,15,25,29,30,40 [10]
 - b Write a program to check the well-formedness of parentheses in an expression using Stacks. [10]
- 3
- a From given traversal sequences construct the binary tree and write pre order sequence: [10]

In order traversal	D	B	F	E	A	G	C	L	J	H	K
Post order traversal	D	F	E	B	G	L	J	K	H	C	A

- b Derive breadth first search (BFS) and depth first search(DFS) sequences for the graph structure shown in Fig. below: [10]



- 4 a Write a C program to implement a queue using arrays. Write a function for Enqueue, Dequeue and Display. [10]

7

- b Given the following processes with their respective burst times and a time quantum of 3 ms, compute the completion time, turnaround time, and waiting time for each process using the Round Robin scheduling algorithm. Also, draw the Gantt chart for the scheduling. [10]

Process ID	Burst Time
P1	5
P2	7
P3	3

- 5 a Sort the following using Bubble sort algorithm $A[7]=[20, 10, 8, 6, 4, 2, 1]$ [10]

- b A logistics company plans direct road routes between five warehouses at locations P, Q, R, S, and T. The estimated construction costs (in lakhs) for each connection are given in the edge list as follows: [10]

$[(P, Q, 6), (P, R, 2), (Q, R, 3), (Q, S, 8), (R, T, 5), (S, T, 7)]$

(Here, an entry like (X, Y, Z) represents a bidirectional rail line between stations X and Y with a construction cost of Z crores.)

Construct the Graph. Apply Kruskal's Algorithm and Prim's Algorithm to construct the Minimum Spanning Tree (MST) starting from office P. Compare the total costs obtained from both algorithms.

- 6 a Explain Expression Trees and construct an expression tree using stack for: $a*b/c+e/f*g+k-x*y$ [10]

- b For the given key sequence 3, 2, 9, 6, 11, 13, 7, 12, construct a hash table using the division method and open hashing (chaining). [10]

Use the hash function $h(k) = (2k + 3) \bmod 10$, with bucket size $m = 10$.

Show intermediate calculations and represent the final hash table clearly.
