POKHARA UNIVERSITY

Level: Bachelor | Semester: Fall | Year : 2023
Programme: BE | Full Marks: 100
Course: Data Structure and Algorithm (New) | Pass Marks: 45
Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.
Attempt all the questions.

1. a) Explain the necessity of data structure with real world examples. What are the worst-case and the best-case time complexities of the following function? 7

```
int add(int A[ ], int n)
{
        int sum = 0;
        for(int i=0; i<n; i++)
                sum = sum + A[i] ;
        return sum ;
}
```

   b) Define Stack ADT. Implement the push and pop operations for array implementation of stack. 8

2. a) When and why do you prefer recursion over iteration? Explain how a stack is used to keep the track of recursive calls and its series of returns with a suitable example. 8

   b) When do you prefer a priority queue over other queues? Compare and contrast singly linked list with doubly linked list. 7

3. a) Implement the enqueue and dequeue operations for a queue that is implemented using a singly linked list. 8

   b) How does selection sort algorithm work? Derive the time complexity of the selection sort in worst case. 7

OR

How do you apply divide and conquer technique in merge sort? Explain with an example.

4. a) Explain the problems with unbalanced binary trees. Explain the four rotations that are applied to create AVL tree. 10

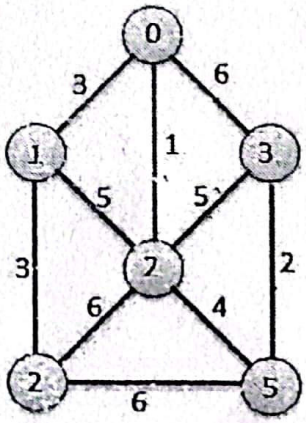
b) What is the significance of a B tree? Create a Huffman tree of a string: "mississippi". 5

5. a) Design and implement a simple hash system with a hash function h(x)= x%10. Use linear probing if a collision is occurred. 10

b) When do you use rehashing? Explain in brief. 5

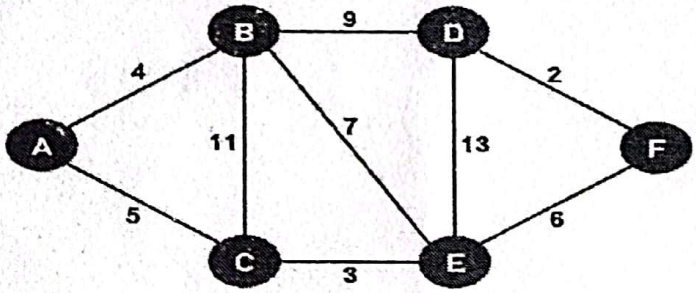
6. a) How are graphs represented in computer? Explain with suitable examples. 7

b) Find the minimum spanning tree of the following graph using Kruskal's algorithm. 8



OR

Find the shortest path from A to F in the given graph using Dijkastra's shortest path algorithm.



7. Write short notes on: **(Any two)** 2×5

a) Double Ended Queue

b) Radix Sort

c) Huffman Algorithm