**SVKM'S**
**Mithibai College of Arts, Chauhan Institute of Science &**
**Amrutben Jivanlal College of Commerce and Economics (Autonomous)**
**Academic Year (2021-22)**
**Class: Second Year Semester: IV**

**Program: Bachelor of Science** | **Max. Marks: 50**
**Subject: Computer Science/Fundamentals of Algorithms** | **Time: 7:30 am to 9:15 am**
**Date:** | **Duration: 1 hr 45 minutes**
**Course Name: Fundamentals of Algorithms** | **Course code: USMACS401**

REGULAR EXAMINATION

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**Instructions: Candidates should read carefully the instructions printed on the question paper and on the cover of the Answer Book, which is provided for their use.**

**1) This question paper contains 2 pages.**
**2) Answer to each new question to be started on a fresh page.**
**3) Figures in brackets on the right hand side indicate full marks.**
**4) Assume Suitable data if necessary**

Q-1 Answer Following (Any two): [14]

1. Given following code explain master theorem used, find its recurrence relation and Complexity:

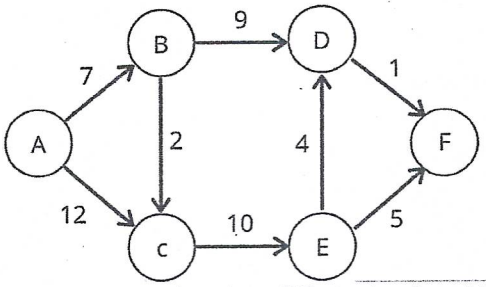
```
def func(n):
    cnt=0
    if n<=0:
        return
    for i in range(0,n) :
        for j in range(0,n):
            cnt=cnt+1
    func(n-3)
    print(cnt)
```

2. Discuss different types of algorithm analysis with its notations. Which is most commonly used analysis? Why?
3. Given following python program, discuss master theorem to find its complexity

```
def func(n):
  if (n<2):
    return
  else:
    cnt=0
  for i in range(0, 16):
      func(n//2)
  for i in range(0, n**4)
      cnt=cnt+1
```

Q-2 Answer Following (Any two): [14]

1. Given following graph:




Find shortest path using dijkstra's algorithm. Consider the source as A.

2. Explain AVL tree with example.
3. Describe tournament method to find 2nd smallest element using following values: 20, 12, 30, 40, 5, 7, 10, 19, 25, 35, 45

Q-3 Answer Following (Any two): [14]

1. What is greedy algorithm? Explain properties of greedy algorithm. Give two applications of greedy algorithm.
2. Find out longest common subsequence of "longest" and "stone".
3. Given following characters and frequency, create Huffman code:

| Character | Frequency |
|---|---|
| A | 11 |
| B | 12 |
| C | 13 |
| D | 14 |
| E | 24 |
| F | 26 |

Q-4 Answer Following: (Any Four) [08]

1. Draw the node structure of threaded binary tree.
2. Explain Recursion or Iteration as algorithm classification method.
3. Discuss worst case complexity of linear search.
4. Discuss in-degree and out-degree with example.
5. Given recurrence relation $T(n)=T(n-3)+n^2$ find its $\Theta$.
6. Describe properties of dynamic programming.