B **311A1** Total Pages: 4

Register No.: .... Name: ....

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FIRST SEMESTER M.TECH DEGREE EXAMINATION (Regular), FEBRUARY 2022

(COMPUTER SCIENCE & SYSTEM ENGINEERING)

(2021 Scheme)

Course Code : **21SE102**

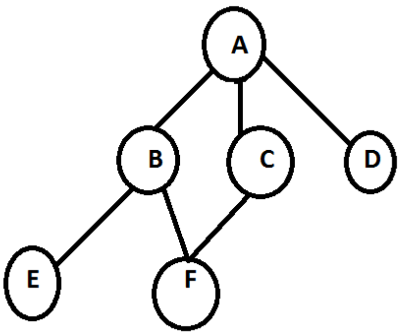
Course Name: **Advanced Algorithmic Concepts**

Max. Marks : **60** **Duration: 3 Hours**

PART A

(Answer all questions. Each question carries 3 marks)

1. How to find the amortized cost for performing Push() and Pop() operations in an Aggregate analysis?
2. Compute the prefix function π for the following pattern P= aaaabaacd where $\Sigma = \{a, b\}$, using KMP Method.
3. Explain how breadth First Search works. For the given graph below, use BFS to visit various vertices taking A as starting vertex. If multiple node choices may be available for the next travel, choose the next node in alphabetic order.



4. How will you convert a multiple source, multiple –sink maximum flow problem into problem with a single source and sink? Explain with an example.
5. State the main difference between P class and NP Class? List some examples of each.
6. Write short notes on Matroid. What are the two conditions where Matroid need to be satisfied?
7. How can we say that Satisfiability of Boolean formulas in 3-SAT is NP Complete?
8. Prove that Independent Set Problem is NP Hard.

PART B

(Answer one full question from each module, each question carries 6 marks)

MODULE I

9. a) Describe the different notations used to describe the asymptotic running time of an algorithm. (3)

b) Draw the recurrence tree for $T(n) = 2T(n/2) + 3n^2$, and solve the recurrence using Iteration method. (3)

OR

10. a) State Masters Theorem. Using this, solve the recurrence relation $T(n) = 4T(n/3) + n^2$. (3)

b) Using Potential Method of amortized analysis, calculate the amortized cost of Push operation in a stack. (3)

MODULE II

11. a) Draw a state transition diagram for a string matching automation for the pattern abababaca over the alphabet (a,b). (2)

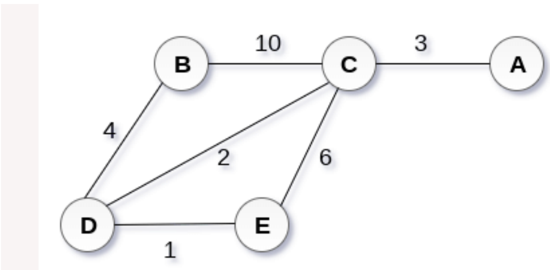
b) Show the red-black trees that result after successively inserting 2, 1,4,5,9,3,6,7 into an initially empty red-black tree. (4)

OR

12. What do you mean by String Matching? With the help of an algorithm explain how Rabin Karp Matcher works. For String matching working module q=13, how many spurious hits does the Rabin-Karp matcher encounter in the text T=23590230415 when looking for the pattern P=41. (6)

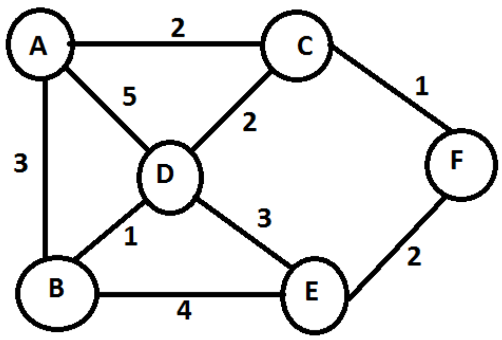
MODULE III

13. Describe Minimum cost spanning tree. Write Prim's algorithm to generate a minimum cost spanning tree for any given weighted graph. Apply the same for the following graph with starting vertex B. (6)



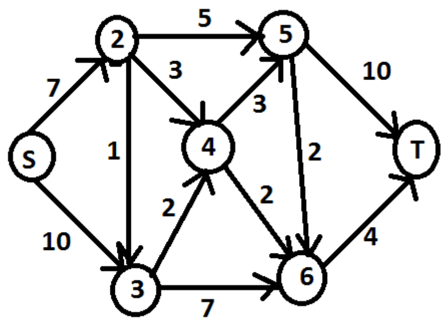
OR

14. A,B,C,D,E,F are six different colleges in Hyderabad. Here we are assuming that you are taking your car in order to cover the distance between different colleges. Being the student of College A. Find the shortest routes to other colleges using Dijkstra's algorithm. (6)



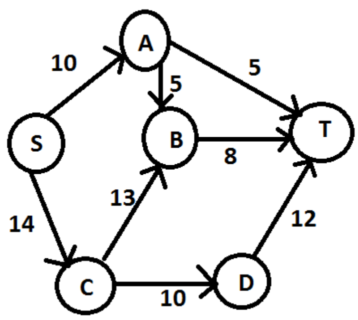
MODULE IV

15. Show the execution of Ford Fulkerson Flow algorithm of a given network with 7 nodes. In every iteration, show the residual network, the augmented path you choose and the updated flows. Find a cut in the network whose capacity equals the maximum flow in the network. (6)



OR

16. Illustrate the running of Edmond-Karp algorithm for finding the maximum flow in the given flow network. In each step draw the residual graph, augmenting path and its capacity. What is the maximum flow for the network and the corresponding min-cut? Analyze its complexity. (6)



MODULE V

17. a) What do you mean by a Greedy Strategy? Explain how Greedy- activity – selector works with the help of an algorithm. (3)

b) Given n activities with their start and finish times. Select the maximum number of activities that can be performed by a single person, assuming that a person can only work on a single activity at a time using the concept of Greedy Strategy. (3)

	A1	A2	A3	A4	A5	A6
Start	0	3	1	5	5	8
Finish	6	4	2	9	7	9

OR

18. Explain the concept of Knapsack problem in Greedy algorithm. Consider 5 items along their respective weights (w) and values (v)

I=(I1,I2,I3,I4,I5)

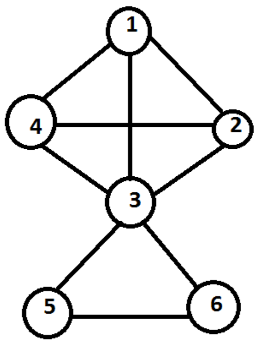
w=(5,10,20,30,40) (6)

v=(30,20,100,90,160)

The capacity of knapsack W=60. Find the solution to the fractional knapsack problem using greedy strategy.

MODULE VI

19. Prove that Clique problem is NP Hard. Calculate the maximum number of cliques in the given graph. (6)



OR

20. How can we say that Graph 3- Color problem is NP Complete? Prove with the help of any examples. (6)

****