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SAINTGITS COLLEGE OF ENGINEERING KOTTAYAM, KERALA

(AN AUTONOMOUS COLLEGE AFFILIATED TO
APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

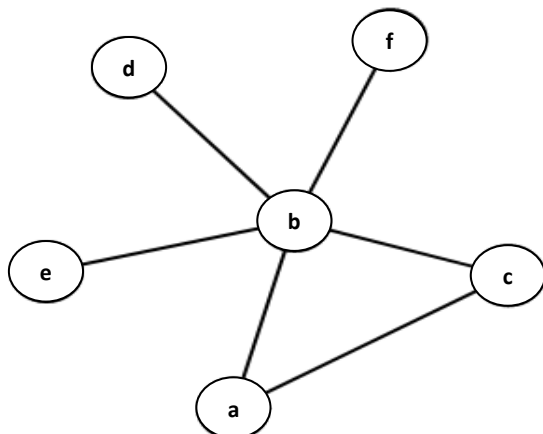
FIRST SEMESTER M.TECH. DEGREE EXAMINATION(R), MARCH 2021 COMPUTER SCIENCE AND SYSTEMS ENGINEERING

Course Code: 20CSSET103**Course Name:** ADVANCED ALGORITHMIC CONCEPTS**Max. Marks:** 60**Duration:** 3 Hours

PART A

(Answer all questions. Each question carries 3 marks)

- Sort the functions in the increasing order of Asymptotic (Big – Oh) complexity Justify your answer.
 $f(x) = x^{0.999999} \log x$
 $g(x) = 1000000x$
 $p(x) = 1.000001^x$
 $r(x) = x^2$
- List down the properties of Red Black Trees.
- Design finite automata for the pattern $P = XYXYXZX$, The alphabet $\Sigma = \{X,Y,Z\}$
- Define Konig's Egravary Theorem
- In what situations dynamic programming method is most preferred?
- What do you understand by the statement "A problem belongs to class NP"?
- What is clique problem?
- What is the vertex cover for the following graph?



PART B

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

MODULE I

9. a. What is a recurrence? (2)
- b. Give Masters' theorem (2)
- c. Apply Master's theorem to solve $T(n) = 6T(n/3) + n^2 \log n$ (2)

OR

10. a. Explain Iteration Method for solving recurrence (2)
- b. Solve $T(n) = 7T(n/2) + n^2$ using Iteration Method (4)

MODULE II

11. Give algorithms for union and extract minimum operations in a Fibonacci heap. Demonstrate by taking suitable example (6)

OR

12. a. What are the properties of B-Tree? (2)
- b. When do we need to split a node of a B-Tree? Explain with suitable example. (4)

MODULE III

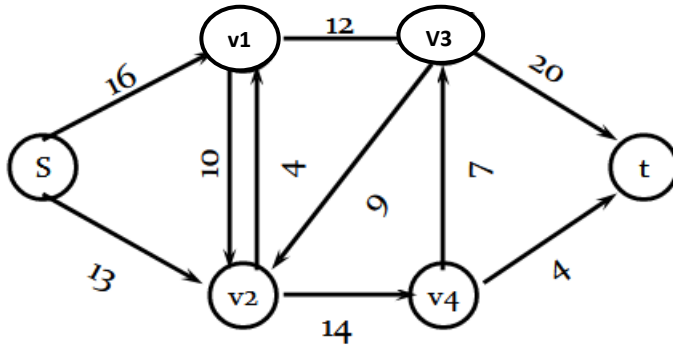
13. a. What is the importance of computing prefix function in KMP(Knuth Morris Pratt) Matcher algorithm ? (2)
- b. Write down the algorithm for prefix function computation in KMP string matching (2)
- c. Compute prefix function for the pattern $P = wxyzwxpwxq$ from the alphabet $\{p,q,w,x,y,z\}$ (2)

OR

14. a. Explain Rabin Karp algorithm for string matching (3)
- b. Consider the text $T = 5767321722$, Pattern $P = 32$, prime number $q = 7$. Show the spurious hits occur while using Rabin Karp method. (3)

MODULE IV

15. Demonstrate the working of Ford Fulkerson Algorithm on the network shown below (6)



OR

16. a. What is a bipartite graph? (1)
 b. Illustrate Maximum Bipartite Matching with suitable example (5)

MODULE V

17. a. What is a matroid? (2)
 b. Show that matroids exhibit optimal substructure and greedy choice property (4)

OR

18. a. What is Class P ? Give example. (2)
 b. A problem P is polynomial time reducible to problem Q. What do you understand by the above statement? Explain reductions in detail. (4)

MODULE VI

19. Show that Independent Set problem is NP Complete (6)

OR

20. Show that graph coloring problem is NP- complete. If you can find a solution for graph coloring problem, there are solutions for all NP Complete problems. Justify this statement. (6)
