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VASAVI COLLEGE OF ENGINEERING (Autonomous), HYDERABAD
M.Tech. (CSE: CBCS) I-Semester Main Examinations, January-2018

Advanced Algorithms

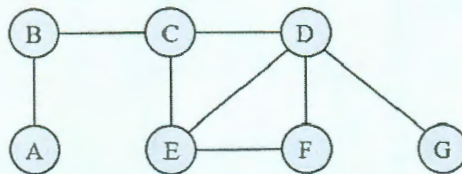
Time: 3 hours

Max. Marks: 60

Note: Answer ALL questions in Part-A and any FIVE from Part-B

Part-A (10 × 2 = 20 Marks)

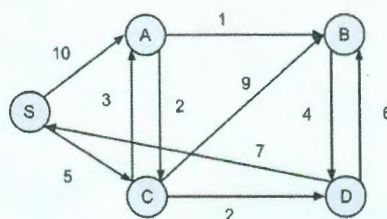
1. Indicate whether *true* or *false*: $2^{2n+3} = \Theta(4^n)$.
2. Determine the minimum possible height of a binary search tree possible with the keys 10, 20, 30, 40, 50, 60, 70, 80, 90 and 100.
3. What is *optimal substructure* property of an optimization problem?
4. Give a DFS traversal of the following graph.



5. Define bipartite graph and give an example.
6. State max-flow min-cut theorem.
7. How many nonempty prefixes of the string $P = "aaabbaaa"$ are also suffixes of P ?
8. State Fermat's little theorem.
9. Define convex hull.
10. What is satisfiability problem?

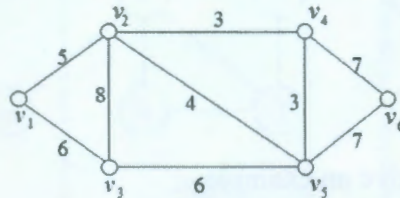
Part-B (5 × 8 = 40 Marks)

11. a) What is a collision in hashing? Explain with a suitable example a collision handling scheme. [4]
 b) Construct (2,4) tree by considering the keys in order : 10;40;30;20;70;50;45;80 and 90. [4]
12. a) Solve the optimal solution to the fractional knapsack instance $n = 3, m = 20, (P_1, P_2, P_3) = (25, 45, 15)$ and $(w_1, w_2, w_3) = (18, 15, 10)$. [3]
 b) Draw a simple, connected, undirected graph with eight vertices and thirteen edges. Give four different Depth First Search traversals of it. [5]
13. a) Apply Dijkstra's algorithm to the following graph by considering vertex S as source. [4]



- b) Define the following terms and give an example for each. [4]
 i) Flow network ii) Minimum cut and iii) Maximum flow.

14. a) Write short notes on the Secure Electronic Transaction (SET) Protocol. [4]
 b) Draw a standard trie for the following set of strings:
 {abab, baba, ccccc, bbaaaa, caa, bbaacc, cbcc, cbca}. [4]
15. a) Explain Quad trees with an example. [4]
 b) Show that CLIQUE is NP-complete. [4]
16. a) What is amortization? Explain accounting method with an example. [4]
 b) Explain with an example algorithm of stack. [4]
17. Answer any *two* of the following:
 a) Define Minimum Spanning Tree (MST)? Find an MST of the following graph by applying Prim's algorithm. [4]



- b) Draw a figure illustrating the comparisons done by the brute-force pattern matching algorithm for the case when the text is "aaabaadaabaaa" and the pattern is "aabaaa". [4]
 c) Define the following complexity classes and give an example for each. [4]
 i) P ii) NP iii) NP-Hard iv) NP-complete.

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