Roll No. ☐☐☐☐☐☐☐☐☐☐☐☐☐   Total No. of Pages : 02

Total No. of Questions : 08

M.Tech. (CSE) (2020 Batch) (Sem.–2)
ADVANCE ALGORITHMS
Subject Code : MTCS-201-18
M.Code : 76055

Time : 3 Hrs.   Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :
 1.   **Attempt any FIVE questions out of EIGHT questions.**
 2.   **Each question carries TWELVE marks.**

1.   a. Topological sort of a Directed Acyclic graph is always Unique. Justify your answer with the help of an example.   (6)

    b. Suppose we perform a sequence of stack operations on a stack whose size never exceeds k. After every k operations, we make a copy of the entire stack for backup purposes. Show that the cost of n stack operations, including copying the stack, is $O(n)$ by assigning suitable amortized costs to the various stack operations.   (6)

2.   Give an efficient push-relabel algorithm to find a maximum matching in a bipartite graph. Analyze your algorithm.   (12)

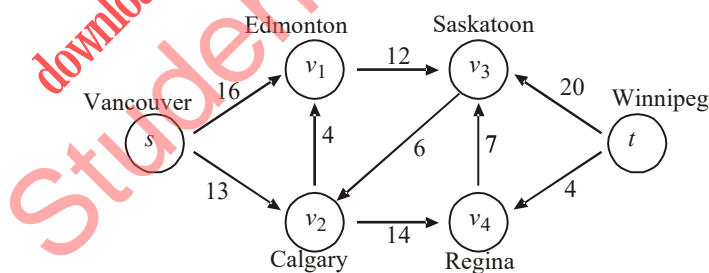3.   Show the execution of the Edmonds-Karp algorithm on the flow network of Figure 1. (12)

FIG. 1

4.   Use Strassen's algorithm to compute the matrix product $\begin{bmatrix} 1 & 3 & 6 & 8 \\ 7 & 5 & 4 & 2 \end{bmatrix}$ (12)

5. Explain Floyd-Warshall shortest path algorithm. Also determine the shortest paths between all pairs of nodes using Floyd-Warshall shortest path algorithm for Figure 2. (4, 8)
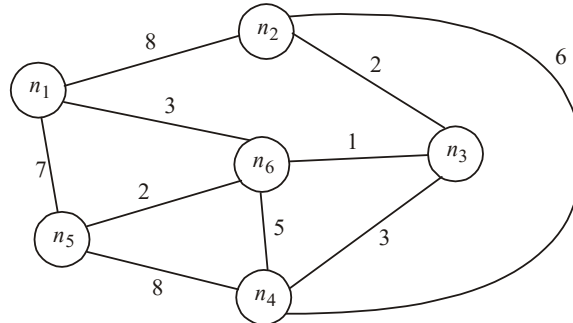

FIG. 2

6. a. Explain Fast Fourier Transform algorithm. (6)

   b. Describe Schonhage-Strassen Integer multiplication algorithm with the help of an example. (6)

7. Explain simplex algorithm along with an example. (12)

8. Write a short note on the following :

   a. NP-Complete (3)

   b. NP-Hard (3)

   c. Chinese Remainder Theorem (3)

   d. Ford-Fulkerson Method to compute maximum flow (3)

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.