APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIRST SEMESTER M. TECH DEGREE EXAMINATION
Computer Science & Engineering
(Computer Science & Systems Engineering)
04CS6403—Advanced Algorithmic Concepts

Max. Marks : 60   Duration: 3 Hours

PART A
Answer All Questions
Each question carries 3 marks

1. Find the asymptotic bound using recursion tree method for the following recurrence.

   $T(n)=T(n/2)+T(n/4)+T(n/8)+n$
2. Find the amortized cost using Potential method for MULTIPOP( ) operation in stack data structure.
3. Compute the prefix function for the pattern **aabaabaaa** when the alphabet is $\Sigma = \{a,b\}$.
4. Write a short notes on Maximum Bipartite matching.
5. Given 10 activities along with their start (S_i) and finish (F_i) time as
      S=(A1,A2,A3,A4,A5,A6,A7,A8,A9,A10)
      S_i=(1,2,3,4,7,8,9,9,11,12)
      F_i=(3,5,4,7,10,9,11,13,12,14)
   Compute a schedule where the largest number of activities takes place using greedy strategy.
6. Write a short notes on NP Complete problems . What is linear integer programming.
7. Design a string matching automaton M, that accepts L = {x|x ends in the string abaca}.
8. Write a short notes on greedy strategy vs dynamic programming.

PART B
Each question carries 6 marks

9. a) Solve the following recurrence relation using iteration method .

   $T(n) = 2(n/2)+3n^2$
   $T(1) = 11$
   b) Find the asymptotic bound using recursion tree method for the following recurrence.
   $T(n)=T(n/2)+T(n/4)+T(n/8)+n$

OR

10. a) Explain the proof of master theorem.
    b) Solve the recurrance relation using master method $T(n)=16T(n/4)+n^3$.

11. a) Demonstrate Fibonacci heap union operation with an example.
    b) Prove, Let T be an RB tree having some internal nodes . Then the height of T is atmost $2lg(n+1)$.

OR

12. a) Give any four properties of a B tree.
   b) Give an example of left rotation on a binary tree .
    c) Show the result of inserting the following items in an initially empty B-tree of order =5
    25,31,38,76,5,60,38,8,30,15,35,17,23,53,27

13. a) Explain KMP algorithm with the help of Text : abxabcabcaby   Pattern: abcaby
    b) Explain Rabin-Karp algorithm ? Illustrate the Rabin Karp algorithm for the

    text : 3141592653589793   Pattern: 26   assign q=11

OR

14. a) Draw a state transition diagram for a string matching automation for the pattern

        ababbabbababb over the alphabet Σ ={a,b}
    b) Explain Max- flow Min- cut theorem with the help of an example.

15. Show the execution of Ford Fulkerson Flow algorithm .Find the minimum cut and the maximum
    flow across the cut . Also find the capacity of the cut.
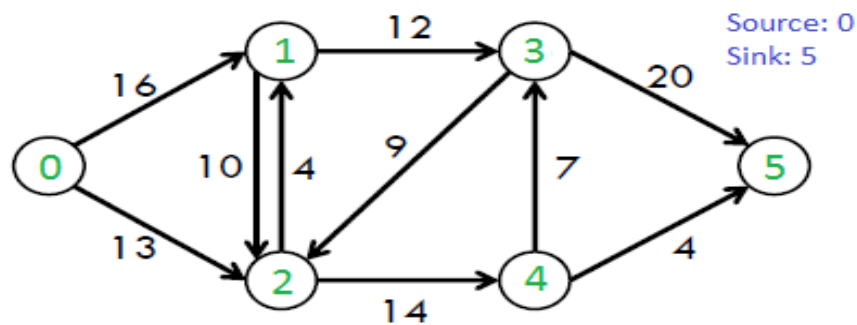
OR

16. a) The value of any flow in a flow network G is bounded from above by the capacity of any cut of G.
       Prove.
    b) Draw a flow network, consider a cut and find the flow across the cut and the capacity of the cut.

17. What is greedy strategy? Also explain optimal substructure property and greedy choice property.

OR

18. If G = (V,E) is an undirected graph, then the graphic matroid MG = (SG,IG) is a matroid. (SG is the
    edge set of G and if A $\subseteq$ E, then A $\in$ IG iff A is acyclic).

19. Prove that Vertex cover problem is NP Complete.

OR

20. Prove that clique problem is NP Complete.