MCSEE21

USN	1	M	S							

M S RAMAIAH INSTITUTE OF TECHNOLOGY

(AUTONOMOUS INSTITUTE, AFFILIATED TO VTU)

BANGALORE – 560 054

SEMESTER END EXAMINATIONS – JANUARY 2015

Course & Branch	:	**M.Tech:- Computer Science Engineering**	**Semester**	:	**I**
Subject	:	**Advanced Algorithms**	**Max. Marks**	:	**100**
Subject Code	:	**MCSEE21**	**Duration**	:	**3 Hrs**

Instructions to the Candidates:

- Answer one full question from each unit.

UNIT – I

1. a) Explain the asymptotic notations – big O, Ω and Θ with mathematical definitions and graphs. (10)

   b) Use Substitution method to show that T(n) $\in O(n \lg n)$ (10)
   $T(1) = 1$, $T(n) = 2T(n/2) + n$

2 a) Define Master Method. Solve the following recurrences using the Master Method: (10)

   i) $T(n) = T(n/2) + 2^n$

   ii) $T(n) = 2T(n/2) + n \lg n$

   b) Analyze the stack operations using the aggregate analysis technique and accounting method. (10)

UNIT – II

3. a) Compare Dijkstra's algorithm with Bellman Ford single source shortest paths algorithm. Apply Dijkstra's algorithm for the graph (Figure 1) and find the shortest distances by considering "p" as the source vertex. (10)

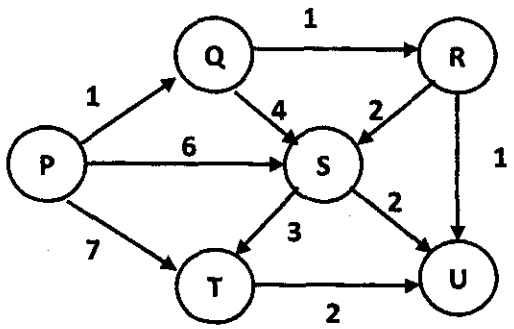

Figure 1

b) With an algorithm, explain the working of Johnson's algorithm for sparse graphs. (10)

4. a) Consider the graph G (Figure 2) and the flow f. (12)

i) Is f a blocking flow?

ii) Give the residual graph Gf .

iii) Find an augmenting path and give the resulting augmented flow. Repeat until the flow is maximum.

iv) Give a saturated (s,t)-cut for the maximum flow.

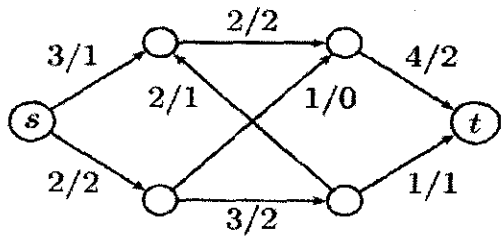

Figure 2

b) Write short notes on Maximum Bipartite matching (08)

UNIT – III

5. a) Write Extended form of Euclid's algorithm. Show the operation of Extended Euclid's algorithm for the input 99 and 78. (10)

b) Show how to use the Chinese remainder theorem to determine all solutions for this set of congruence equations: (10)

$x \equiv 2 \bmod 11$

$x \equiv 3 \bmod 12$

$x \equiv 4 \bmod 13$

$x \equiv 5 \bmod 17$

$x \equiv 6 \bmod 19$

6. a) Write a modular exponentiation algorithm that examines the bits of b and computes $a^b \pmod{n}$. Trace the algorithm for the input a=7, b=560 and n=561 (10)

b) Consider an RSA key set with p=11, q=29, n=319 and e=3. What value of d should be used in the secret key? What is the encryption of the message M=100. (10)

UNIT – IV

7. a) Write the features and compare the running time analysis (pre-processing time and matching time) of the following string matching algorithms: (10)
   i) Naïve string matching
   ii) KMP
   iii) Boyer Moore

   b) Working modulo q=3, how many spurious hits does the Rabin – Karp matcher encounter in the text T = 4126719021586 when looking for the pattern P = 125? (10)

8. a) Write the pseudocode COMNTE-PREFIX-FUNCTION(P). With suitable example, illustrate the computation of the prefix function π in KMp algorithm. (10)

   b) Compare Boyer-moore algorithm with Horsepod algorithm. Illustrate Boyer-moore algorithm with an example. (10)

UNIT – V

9. a) Define vertex cover problem. Write an approximation algorithm to find the vertex cover of a given undirected graph. Illustrate the operation of the algorithm with an example. (10)

   b) Write the GREEDY-SET-COVER algorithm. Consider each of the following words as a set of letters: {arid, dash, drain, heard, lost, nose, shun, slate, snare, thread}. Show which set cover GREEDY-SET-COVER produces when ties are broken in favor of the word that appears first in the dictionary. (10)

10. a) With an example, compare APPROX-TSP-TOUR(G,C)with branch and bound based TSP problem. (10)

    b) Write a detailed note on the subset-sum problem. (10)

****