PG – 561

IV Semester M.C.A. Examination, June/July 2018
(CBCS)
COMPUTER SCIENCE
MCA 402T : Advanced Algorithms

Time : 3 Hours Max. Marks : 70

***Instruction** : Answer **any five** from Part – **A** and **any four** from Part – **B**.*

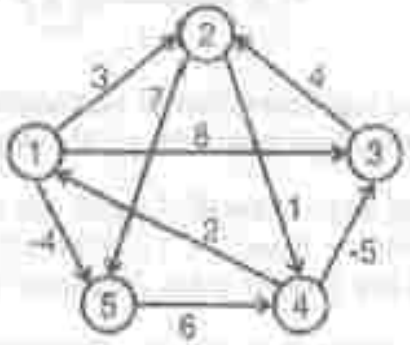
PART – A

Answer **any five** of the following. **Each** question carries **6** marks : **(5x6=30)**

1. Define and explain various asymptotic notations used to represent the rate of growth of algorithms running time.

2. Solve the following recurrence relation to give tight upper bound using substitution method $T(n)=2T\left(\frac{n}{2}\right)+n$.

3. Compute all-pairs shortest paths for the following sparse graph using Johnson's Algorithm.



4. Explain maximum bipartite matching with suitable example.

5. Solve the following congruence using Chinese Remainder Theorem:
   a) $x \equiv 2 \pmod 3$
   b) $x \equiv 4 \pmod 5$
   c) $x \equiv 5 \pmod 7$

6. Write extended Euclid's algorithm and also find GCD (161, 28) using extended form.

P.T.O.

7. Apply Boyer Moore algorithm to search pattern "BAOBAB" in the text "BESS_KNEW_ABOUT_BAOBABS".

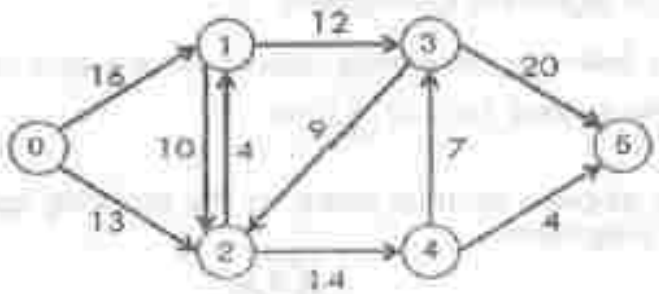
8. Discuss about parallel search algorithms.

PART – B

Answer **any four** of the following. **Each** question carries **10** marks. **(4×10=40)**

9. Illustrate aggregate analysis of amortized analysis on stack operations and increment in a binary counter.

10. For the following graph with initial capacity. Find the maximum flow using basic Ford-Fulkerson algorithm.



11. Explain point value representation of polynomial s with example and also show addition and multiplication using point values.

12. Write the procedural steps of the RSA public-key cryptosystem. Also, consider an RSA key set with p = 7 and q = 17 and e = 5. What value of d should be used in the secret key ? What is the encryption of the message M = 19 ?

13. Write and explain Rabin-Karp string matching algorithm. Working modulo q = 13, how many spurious hit does the Rabin-Karp matcher encounter for the text T = 2 3 5 9 0 2 3 1 4 1 5 2 6 7 3 9 9 2 1. When looking for the pattern P = 3 1 4 1 5.

14. Write short notes on :

a) Travelling Salesman Problem. 5

b) Single source shortest path in Directed Acyclic Graph (DAG). 5

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PART – A

Answer **any five** of the following. **Each** question carries **six** marks. **(5×6=30)**

1. Use a recursion tree to solve the recurrence

   $T(n) = 2T\left(\frac{n}{2}\right) + n.$

2. Solve the following recurrence using substituion method

   $T(n) = 4T\left(\frac{n}{2}\right) + n.$

3. Produce Euclid's algorithm to find the GCD of two integers and comment on the efficiency of the algorithm.

4. Prove that the system $(Z_n, +_n)$ is a abelian group.

5. Produce Naive pattern matching algorithm and investigate the efficiency of the algorithm.

6. Explain set covering problem.

7. Solve the following instance of subset sum problem

   $S = \{10, 14, 15, 19\}$ $T = 35$ $\varepsilon = 0.3$.

8. Explain Dynamic programming strategy. Apply it to generate Fibonacci series.

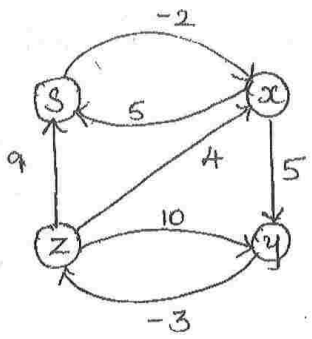
P.T.O.

PART – B

Answer **any four** of the following questions. **Each** question carries **10** marks. **(10×4=40)**

9. Illustrate the potential method using stack operations.

10. Using Bellman ford algorithm find the shortest path from the source vertex S to the remaining vertices in graph



11. Write Chinese remainder theorem. Also find all the integers that leave remainder 1, 2, 3 when divided by 9, 8, 7 respectively using Chinese remainder theorem.

12. Explain Johnson's algorithm for sparse graphs.

13. Explain Rabin-carp algorithm for pattern matching.

    Trace the algorithm to search "aab" in "abaaab".

14. Write short notes on :
    a) Flow networks. **5**
    b) DFT and FFT. **5**

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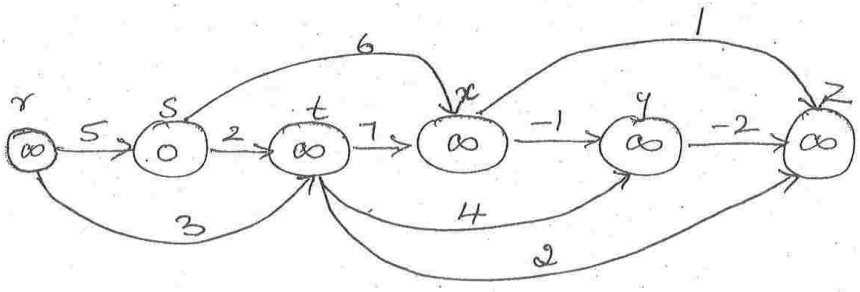
IV Semester M.C.A. Examination, June 2016
(CBCS)
COMPUTER SCIENCE
MCA 402 T : Advanced Algorithms

Time : 3 Hours | Max. Marks : 70

PART – A

Answer **any five** of the following. **Each** question carries **six** marks. **(5x6=30)**

1. Explain different types of Asymptotic Notations.
2. Using the Master Method, solve the following recurrences :
   a) $T(n) = 8T\left(\frac{n}{2}\right) + \theta(n^2)$
   b) $T(n) = 3T\left(\frac{n}{4}\right) + n \log n$.
3. Write an algorithm for single-source shortest path in DAG. Also apply the algorithm for the following graph by taking source vertex as 'S'.



4. Explain Max-Flow Min-Cut theorem an algorithm.
5. 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 ?

$\phi = 280$, $(d \times e) \pmod{280}$
$(187 \times 3) \pmod{280}$

P.T.O.

6. Working modulo q = 11, how many spurious hits does the Rabin-Karp matcher encounter in the text T = 3141592653589793 when looking for the pattern P = 26.

7. Solve the following instance of the subset sum problem for

   S = {3, 34, 4, 12, 5, 2} and sum = 9.

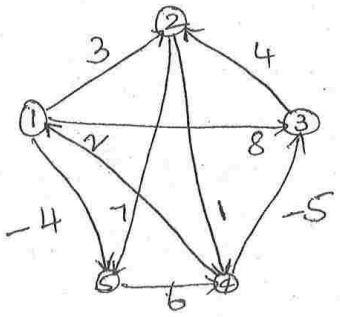
8. List and discuss three major constraints to be taken care of while designing a parallel algorithm.

PART – B

Answer **any four** of the following questions. **Each** carries **10** marks : **(10×4=40)**

9. Explain aggregate analysis with stack operations and incrementing a binary counter.

10. Compute all-pairs shortest paths for the following directed graph using Johnson's algorithm.



11. Give the pseudocode for computing extended Euclid. Find gcd (99, 78) using extended Euclid's algorithm and show the computation steps at each level of recursion.

12. Explain Boyer Moore Algorithm for string Matching and trace the algorithm for the following text and pattern :

    T : GTTATAGCTGATCGCGGCGTAGCGGCGAA

    P : GTAGCGGCG

13. Explain Approximation vertex cover algorithm with neat diagram. Explain its operation through psuedocode.

14. Write short notes on :

    a) String Matching with Finite Automata.

    b) Travelling salesman problem (TSP).