M.E. First Semester (Computer Sci. & Engg.) (P.T.) (CBS)

13161 : Algorithmics : 1 RME 2 / 1 KMEF 2 / 1 RMEF 2

P. Pages : 2 | AU - 3234

Time : Three Hours | Max. Marks : 80

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1. a) Prove by contradiction "There are infinitely many prime numbers". Illustrate the proof by an algorithm. 6

   b) Prove that O notation is reflexive : $F(n) \in O(f(n))$ for any function $F : N \rightarrow R \geq O$. 7

OR

2. a) What is worst case analysis? Explain it in comparison with average case analysis. 6

   b) What do you mean by conditional asymptotic notation? Explain with example. 7

3. a) Solve the following homogeneous recurrence. 7

$$t_n = \begin{cases} n & \text{if } n = 0, 1 \text{ or } 2 \\ 5t_{n-1} - 8t_{n-2} + 4t_{n-3} & \text{otherwise} \end{cases}$$

   b) Explain analysis of algorithm using the barometer instruction. 6

OR

4. What is amortized analysis? Describe in detail along with the potential function and accounting trick. 13

5. a) Prove that Quicksort takes a time in $O(n \log n)$ to sort n elements on the average. 7

   b) What do you mean by scheduling? Explain scheduling with deadlines by taking suitable example. 7

OR

6. a) Prove that Dijkstra's algorithm finds the shortest paths from a single source to the other nodes of a graph. 7

   b) Explain the method suggested by Volker Strassen for matrix multiplication. What is its time complexity? What is the time complexity of the method suggested by Victor Pan? 7

7. a) Explain principle of optimality. 6

   b) Explain and analyse memory functions as an example of dynamic programming. 7

OR

8. Explain chained matrix multiplication algorithm for dynamic programming. State how the algorithm works to calculate the product of four matrices where, 13
A is 13×5, B is 5×89, C is 89×3 and D is 3×34.

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9. a) Show that algorithm parpaths can be executed using $0(n^3 / \log n)$ processors taking a time in $\theta(\log^2 n)$. 7

b) Explain parallel sorting algorithm in detail. 6

OR

10. a) Explain the principle of pseudo random number generation. 6

b) Write down the Las Vegas algorithm for the eight Queens problem and analyse. 7

11. a) Prove that : 7
$MQ \leq^{\ell} MT$ assuming MT is smooth.

b) Prove the theorem : 7
SAT – 3 – CNF is NP complete.

OR

12. a) Prove that any binary tree with K leaves has an average height of atleast Lg K. 7

b) Prove that : 7
$IT2 \leq^{\ell} MQ$, assuming MQ is strongly Quadratic.

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