2017

COMPUTER SCIENCE AND ENGINEERING

Paper – CSCL-0901

(Topics in Algorithms)

Full Marks – 70

The figures in the margin indicate full marks
Candidates are required to give their answers in their own words as far as practicable

Group – A

Answer *any five* questions 2×5

1. Solve the following recurrence equation by Master Theorem.

$$T(n) = 3T(n/2) + n^2.$$

2. What is meant by Pspace?

3. State Fermat's Little Theorem. What are Pseudo-primes?

4. What is meant by Decision problem? Give an example.

5. State base-function property of the family of algorithms.

6. What is meant by SM SIMD computers?

7. What is meant by Odd-even merging network?

Group – B

Answer *any five* questions

8. State and explain Master's Theorem.   1+3

9. Write a brief note on Red-Black Trees.   4

10. What are online algorithms? What do you mean by competitive analysis in regard to online algorithms?   2+2

11. Write a randomized algorithm for computing the value of π. Explain the steps.   4

12. Define primitive recursion. Show how two-variable addition function can be defined by primitive recursion.   1+3

13. Given a flow F in a network, prove that the flow out of the source 'a' equals the flow into the sink 'z'.   4

14. Suppose that α is a family of algorithms in which properties 1, 2 and 4 are satisfied. Then show that the one-variable function f where

$$f(x) = \begin{cases} 0 & \text{if } x = 0 \\ 1 & \text{if } x \neq 0 \end{cases}$$

is algorithmic in α.   4

[Turn Over]

Group – C

Answer *any four* questions

15. State and establish Chinese Remainder Theorem.   2+8

16. Explain what is meant by convex hull. Write Graham's Algorithm for computing the convex hull. Illustrate.   2+8

17. Explain, with an example, how does KMP algorithm work.   10

18. Prove that 3SAT problem is NP-complete.   10

19. Describe the twice-around-the-tree algorithm for Travelling Salesperson problem. Prove that it is a 2-approximaion algorithm with Euclidean distances.   5+5

20. Write a divide and conquer algorithm for finding the distance between a closest pair of points.   10

21. State the essential features of a parallel searching algorithm based on EREW architecture.   10