Mekelle University

Ethiopian Institute of Technology-Mekelle (EiT-M)

School of Computing

Department of Computer Science

Complexity Theory (COSC4132) Final Exam out of 40%

Name _____	Section _____
ID No _____	Time Allowed: 1 hour

PART I: Choose the best answer (2pts.)

1. Time complexity order of bubble sort algorithm is

   A. $O(n^2)$ B. $O(n)$ C. $O(n^2)$ D. $O(n \log n)$

2. Time complexity order of binary search algorithm is

   A. $O(n)$ B. $O(n^2)$ C. $O(1)$ D. $O(\log n)$

3. A Turing Machine having multiple tapes and each tape is accessed by a different head that moves independently of other heads called.

   A. Multi-head TM B. Multi-tape TM C. D. Universal TM D. Non-Deterministic TM

4. The amount of resources that are required to run an algorithm is

   A. Complexity theory B. Computability Theory C. Automata Theory D. None

5. If L and M are two irregular languages then their union L U M is also a union.

   A. True B. False C. A and B D. None

6. Type zero grammar is recognized by

   A. Finite Automata B. Turing Machine C. Linear Bounded Automata D. Pushdown Automata

7. Which of the following tuple is not element of Finite Automata

   A. F B. q_0 C. blank symbol D. transition

8. What is the time complexity of $\log_2 n + 245\log 4^n + n^2 + \log 2^{\log(n)}$

   A. n^2 B. $\log_2 n$ C. $\log 4^n$ D. $\log 2^{\log(n)}$

9. Which one of the following is example of NP class problem?

   A. Binary Search B. Quick Sort C. Matrix Multiplication D. Hamiltonian Cycle

10. The systematic way to express the upper bound of an algorithm's running time is

    A. Big O notation B. Theta notation C. Omega notation D. A and C

PART II: Say True if the statement is correct else False (2pts.)

1. Pushdown Automata is Finite Automat plus additional Stack (FA + STACK).
2. If P is a regular language then its kleen closure has zero or more occurrence.
3. Regular expression is the pictorial way to represent a language.

PART III: Fill the blank space (2pts.)

1. _____ refers to whether a problem has an algorithm that can solve it for all inputs.
2. _____ represents problems that can be solved by efficient algorithms in polynomial time.

PART IV: Define the following questions (2pts.)

1. Recursive language vs Recursively enumerable language.
2. The differences between decidability and Undecidability.
3. Construct a Regular Expression that recognizes an email address.
4. Construct a CFG for Palindrome.
5. Write a program that computes factorial of a number using recursive function.

Please put your answer here!

PART I: Choice

1. _____ 2. _____ 3. _____ 4. _____ 5. _____ 6. _____ 7. _____ 8. _____ 9. _____ 10. _____

PART II: True or False

1._____ 2. ._____ 3. ._____

PART III: Fill the blank space

1._____ 2. ._____

PART IV: Definition