CROSS RIVER UNIVERSITY OF TECHNOLOGY, CALABAR
DEPARTMENT OF COMPUTER SCIENCE
FIRST SEMESTER EXAMINATIONS 2016/2017 SESSION

COURSE CODE: CSC 1101
COURSE TITLE: INTRODUCTION TO PROBLEM SOLVING **TIME: 3HRS**
INSTRUCTION: Answer all questions.

SECTION A

Answer all questions in this session

1. The sequence of instructions within an algorithm or program is referred as _____
2. This term refers in meaning to a named store of value in algorithm program _____
3. All algorithms are programs, but not all programs are algorithms. True/False?
4. This refers to the consideration of logical operation independent of actual physical implementation _____
5. A _____is a scheme for organizing data within computing system, or a particular implementation of any such scheme.
6. An _____ is a style in which an algorithm is designed so as to achieve certain types of control flow, and by so doing meet certain design requirements for that algorithm.
7. The shortest control flow path through an algorithm comprises its _____ case.
8. A modular number system is one in which numbers are considered in terms of _____ relative to a common base.
9. This term, hinting at something fake, refers to the literal representation of algorithms in design _____
10. This LATIN term is used to describe the logical analysis of algorithm performance_____

SECTION B

Please answer only ONE question in this section

1. Outline, then describe the FOUR stages of the Problem Solving Process, using a problem you have thought up. Be original with this.
2. Describe TWO algorithm design patterns you can recall, highlighting, with examples:
   a. Their similarities; and
   b. The difference between them.

SECTION C

Please answer only ONE question in this section

1. Write a simple algorithm to determine the smallest element in an array of integers.
2. Write a simple algorithm to find the lowest common multiple of two integers.

SECTION D

Please answer only ONE question in this section

1. A palindrome is a word which spells the same way backwards as well forward; for instance, 'refer' and 'madam' are both palindromes.
   a. Write an algorithm *Palindrome* (word) to determine if a given word is a palindrome, and then
   b. Determine its time complexity in the:
   i. Average case
   ii. Worst case
2. A prime number is a number which only has itself and one as factors (numbers which can be divide it perfectly). Write two functions as follows.
   a. The first, *Factors(n)*, to obtain the factors of a positive integer n in an array; and
   b. The second, *Is Prime(n)*, to show if n is indeed prime.
   c. For both functions, find
      i. Θ(n)
      ii. O(n)
3. A banker has to access the vault at his bank branch in Ikeja, Lagos. The combination he must key in is a sequence of 6 digits, each of which may either be a numeral (0-9) or either of the symbols * or #. In simple pseudocode, design an algorithm *Login(code)* to detail this scenario, returning a Boolean value for access or denial. You are required to validate for:
   a. The length of the code input;
   b. The type of input (i.e. the characters are from the specified range; and
   c. The number of tries, so that he cannot access the vault if he fails after 3 attempts.