Xi'an Jiaotong-Liverpool University 西交利物浦大學

PAPER CODE	EXAMINER	DEPARTMENT	TEL
CSE102		Computer Science and Software Engineering	

2nd SEMESTER 2016/17 EXAMINATIONS (FINAL)

BACHELOR DEGREE – Year 2

ALGORITHMIC FOUNDATIONS AND PROBLEM SOLVING

TIME ALLOWED: 2 Hours

INSTRUCTIONS TO CANDIDATES

READ THE FOLLOWING CAREFULLY:

1. The paper consists of Part A and Part B. Answer all questions in both parts.
2. Answer all questions in Part A using the Multiple Choice Answer Sheet. Please read the instructions on the Multiple Choice Answer Sheet carefully and use a HB pencil to mark the Multiple Choice Answer Sheet. If you change your mind, be sure to erase the mark you have made. You may then mark the alternative answer.
3. Answer all questions in Part B using the answer booklet.
4. Enter your name and student ID No. on BOTH the Multiple Choice Answer Sheet and the answer booklet.
5. At the end of the examination, be absolutely sure to hand in BOTH the answer booklet AND the Multiple Choice Answer Sheet.
6. All answers must be in English.

THIS PAPER MUST NOT BE REMOVED FROM THE EXAMINATION ROOM

PART B (25 marks)

1. Briefly describe the idea of the dynamic programming technique. **3**

2. Change-making problem: give change for amount n using the minimum number of coins of values $d_1 < d_2 < \cdots < d_m$. Assume that there are unlimited quantities of coins for each of the m values $d_1 < d_2 < \cdots < d_m$ where $d_1 = 1$.

   a) Let $F(n)$ be the minimum number of coins whose values add up to n. For convenience, define $F(0)=0$. Set up a recurrence relation for $F(n)$ ($n > 0$) that can be used by a dynamic programming algorithm. **6**

   b) For the amount $n = 6$ and coin values 1, 3 and 4, solving the Change-making problem using the relation set in a). **5**

   c) Write pseudocode of the dynamic programming algorithm for solving this problem and determine its time complexity. **5**

3. Given any two decision problems A and B, what is a polynomial time reduction from A to B? Briefly explain how this technique can be used to prove certain problems are NP-hard. **6**

END OF THE PAPER