Xi'an Jiaotong-Liverpool University

西交利物浦大學

PAPER CODE	EXAMINER	DEPARTMENT	TEL
CSE104		Computer Science and Software Engineering	

2nd SEMESTER 2016/17 FINAL EXAMINATIONS

BACHELOR DEGREE – Year 2

DATA STRUCTURES AND ALGORITHMS

TIME ALLOWED: 2 Hours

INSTRUCTIONS TO CANDIDATES

1、 **Answer all questions.**

2、 **Answers should be written in the answer booklet(s) provided.**

3、 **No calculator is allowed during the examination.**

4、 **Only answers in English are accepted.**

THIS PAPER MUST NOT BE REMOVED FROM THE EXAM HALL.

Part II. (25marks) Answer the following Question.

31. Assume ternary coding is used in the following, i.e. 3 symbols can be used e.g. 0, 1, 2 instead of 2 symbols in binary coding. You are assigned to design a Huffman source encoder, from which all network input symbols are encoded. Your source encoder will produce **minimal** output (in terms of bandwidth used) based on the frequency of the input symbols.

(a) Specify the data structures & methods (or functions) for your algorithm use. You must explain **briefly** why these are used. **10**

(b) Develop in the following the pseudo code of your encoding algorithm, which will build an encoding tree from leaves. **15**

You have the following as input:
S is a data structure containing pairs (*a*, *f* [*a*]) where
a is a character in the input alphabet and
f [*a*] is its frequency in the text.

Your algorithm (in pseudo code) will make use of the input given to build such an encoding tree, while in the end it returns the root node.

Do not write your algorithm as a complete Java program.

Use the following template to fill in your solutions:

```
Ternary_Huffman     ENCODING (building tree from leaves)
n ← |S|; Q ← S;
while (|Q|>1){
…
…
```

Your solutions should not exceed 10 lines of pseudo code.

END OF PAPER