

國立清華大學命題紙

99 學年度 資訊系統與應用研究所甲組(資訊系統管理組) 碩士班入學考試

科目 計算機概論 科目代碼 2001 共 2 頁, 第 1 頁 *請在【答案卷卡】作答

1. (12%) Explain the following terms:
 - (a) MIMD
 - (b) SIMD
 - (c) SISD
 - (d) MISD

2. (10%) What is an algorithm? What is a program? What is the main difference between these two?

3. (10%) What is deadlock? What mechanisms can solve the deadlock problem?

4. Given a checkerboard consisting of 2^n rows and 2^n columns of squares, for some positive integer n , and a box of L-shaped tiles, each of which can cover exactly three squares on board, please answer the following questions.
 - (a) (12%) If any single square is cut out of the board, can the remaining board be covered with tiles such that tiles do not overlap or hang off the edge of the board? (To get the score, you need to prove your answer. No score if you only answer true or false).
 - (b) (10%) Explain how you can use your solution of (a) to prove that $2^{2^n} - 1$ is (or is not) divisible by 3 for all positive integers n .

5. (10%) Is the following statement true or false? To get the score, you need to prove your answer. (No score if you only answer true or false)

In a small town, everyone owns his or her own house. John is a house painter. He claims that he paints all those and only those houses that are not painted by their owners. Is John honest?

6. (10%) Frederick Brooks' *Mythical Man-Month* described the virtues of top-down software design: "A good top-down design avoids bugs in several ways. First, the clarity of structure and representation makes the precise statement of requirements and functions of the modules easier. Second, the partitioning and independence of modules avoids system bugs. Third, the suppression of detail makes flaws in the structure more apparent. Fourth, the design can be tested at each of its refinement steps, so testing can start earlier and focus on the proper level of detail at each step." Please briefly explain the main principles behind these statements.

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7. (12%) Please indicate (Yes/No) and briefly explain whether each of the following applications could be suitable for a queue. (No score if you only answer Yes or No)
- (a) A program to solve a maze is to backtrack to an earlier position (the last place where a choice was made) when a dead-end position is reached.
 - (b) A grocery chain wants to run a simulation to see how average customer wait time would be affected by changing the number of checkout lines in the store.
 - (c) A dictionary of words used by a spelling checker is to be initialized.
 - (d) Gamblers are to take numbers in the lottery and win if their numbers are picked.
8. (8%) What is *Object-Oriented Programming* (OOP)? What is meant by *Inheritance*? Please explain with examples.
9. (6%) Computing x^n for some real number x and an integral power $n \geq 0$ has a simple recursive solution:
- $$x^n = x x^{n-1}$$
- $$x^0 = 1$$
- (a) What recurrence relation describes this algorithm's time requirement?
 - (b) By solving this recurrence relation, determine the Big Oh of this algorithm.