

國立清華大學命題紙

99 學年度 資訊系統與應用研究所乙組(數位學習科技組) 碩士班入學考試

科目 計算機概論 科目代碼 2101 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%) What is the difference between the while statement and the repeat statement. Please limit your answer to one sentence only.
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.

- (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 *polymorphism*? Please explain with examples.

9. (6%) Consider the following Java statements:

```
int n = 7;
StackInterface myStack = new ArrayStack();
while (n > 0)
{
myStack.push(new Integer(n));
n--;
} // end while
int result = 1;
while (!myStack.isEmpty())
{
Integer integer (Integer)myStack.pop();
result = result * integer.intValue();
} // end while
System.out.println("result = " + result);
```

- (a) What value is displayed when this code executes?
- (b) What mathematical function does the code evaluate?