國立政治大學 112 學年度 碩士班暨碩士在職專班 招生考試試題

第一頁,共分頁

考 試 科 目計算機概論 系 所 別資訊科學系碩士在職專班 考 試 時 間 ン 月 5 日(日) 第之 節

You can write down you answers in either Chinese or English.

- 1. (20%) True or False
 - (a) The power consumption of a CPU is proportional to the clock rate.
 - (b) The page table resides in the cache and memory at the same time.
 - (c) Increasing the cache size resulting in decreasing capacity misses and reducing cache assess time.
 - (d) The IEEE 754 single precision floating point representation of "-35.75" is "11000010000011110000000000000000".
 - (e) The worse time complexity of Mergesort is $O(n^2)$
 - (f) Heap memory, aka "dynamic" memory, is used to save local variables in a function.
 - (g) The regular expression x* denotes the set of all strings of one or more x's.
 - (h) Both NAND and XOR are functionally complete.
 - (i) SRAM is used for cache memory, which is a lower-density device in terms of transistors than DRAM.
 - (j) It is necessary to have a stack when implementing a recursive function.

2. (20%) Multiple Choice Question

- (a) About TLB and cache, choose all the correct statements:
 - (1) It is possible to have a TLB hit and a cache hit, followed by a page miss.
 - (2) It is possible to have a TLB hit and a cache miss, followed by a page hit.
 - (3) It is possible to have a TLB miss and a cache miss, followed by a page hit.
 - (4) It is possible to have a TLB miss and a cache hit, followed by a page miss.
- (b) Please choose the correct asymptotic relationship(s).
 - (1) n^k is $O(c^k)$, as $k \ge 1$, and c > 1.
 - (2) $\log_2 n$ is $\Omega(\log_8 n)$
 - (3) $\log_2 n^{\log_2 51}$ is $\Omega(\log_2 51^{\log_2 n})$
 - (4) $\log_2 n^{\log_2 51}$ is $O(\log_2 51^{\log_2 n})$
- (c) Please choose the correct statement(s).
 - (1) If A and B are two mutually exclusive events with $P(A) = \frac{1}{3}$ and $P(B) = \frac{1}{4}$. Then $P(\overline{A} \cap \overline{B}) = \frac{5}{12}$.
 - (2) A can solve 90% of the questions in an exam while B can only solve 70%. The probability that at least one of them can solve a question randomly picked from the exam at least 0.95.
 - (3) A bag has 5 red balls and 5 black balls. Assume that you draw a ball from the bag and throw it away without knowing what color it is. Now, the bag has only 9 balls. The probability that you draw a ball again and get a red ball is $\frac{1}{2}$.
 - (4) If A and B are independent events, then A and B are mutually exclusive.

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考 試 科 目計算機概論 系 所 別資訊科學系碩士在職專班 考 試 時 間 之月 5日(日)第2節

- (d) Let $U = \{0,1,2,3,4,5,6,7,8,9\}$ be a universal set. Let $A = \{1,2,3,4,5\}, B = \{2,4,6,8\}, C = \{1,3,5,7,9\}$. Please choose the correct statement(s).
 - (1) $(A \cup B)' \cap C = \{7,8\}$

(3) $(A'-B)' = \{1,2,3,4,5\}$

(2) $(A' \cap B)' - C = \{6,8\}$

- $(4) (B \cup C)' = \emptyset$
- 3. (10%) There are two pieces of code below:

```
int cmp1(int a, int b)
{
  int result;
  a = (a<0) ? -a : a;
  b = (b<0) ? -b : b;
  result = (a==b);
  if (result)
    printf("The absolute values of %d and %d are the same.", a, b);
  else
    printf("The absolute values of %d and %d are different.", a, b);
  return result;
}</pre>
```

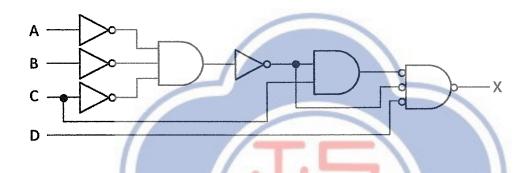
```
#define ABS(n) ((n<0) ? -n : n)
int cmp2(int a, int b)
{
   int result = (ABS(a)=ABS(b));
   if (result)
      printf("The absolute values of %d and %d are the same.", a, b);
   else
      printf("The absolute values of %d and %d are different.", a, b);
   return result;
}</pre>
```

Consider the two function 'cmp1' and 'cmp2', where a and b are integers.

- i) (5%) Do cmp1 and cmp2 print the same message for all possible inputs? If not, please provide a case where they print it.
- ii)(5%) Do cmp1 and cmp2 return the same value for all possible inputs? If not, please provide a case where they return it.

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- 4. (20%) What is Artificial intelligence (AI)? Please name three applications that use AI and explain what we can do with them.
- 5. (15%) Logic design.
 - (a) (5%) Please simplify the logic circuit below. You need to give a Boolean function using the four variables, A, B, C, and D.



- (b) (10%) Given a Boolean function, $\bar{A}\bar{B}\bar{C}\bar{D} + \bar{A}\bar{B}\bar{C}\bar{D} + \bar{A}\bar{C}\bar{D} + \bar{A}\bar{C}\bar{D} + \bar{A}\bar{C}\bar{D} + \bar{A}\bar{C}\bar{D} + \bar{A}\bar{C}\bar{D} + \bar{A}\bar{C}\bar{D} +$
- 6. (15%) Please solve the recurrence relation $T(n) = 2T(\frac{n}{2}) + nlog n$. (You need to write down how you develop the solution instead of only giving the answer)

註

一、作答於試題上者,不予計分。