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	2 月 8 日（ 六 ） 第 三 節

1. (15%) Please give the binary representation for the smallest negative floating point number greater than -1 using the IEEE 754 standard for single precision format.

2. (10%) Please give the asymptotic bound (as tight as possible) using the Big-O notation for the following recurrence. Please justify your answer.

$$f(n) = 25f\left(\frac{n}{5}\right) + 2n^2$$

3. (15%) Assume that we have a demand-paged memory. The page table is held in register. It takes 8 milliseconds to service a page fault if an empty page is available or the replaced page is not modified, and 20 milliseconds if the replaced page is modified. The memory access time is 100 nanoseconds. Assume that the page to be replaced is modified 70 percent of the time. Please give the maximum acceptable page-fault rate for an effective access time of no more than 200 nanoseconds, and justify your answer.

4. Please implement the Boolean function

$$F = x \cdot y + \bar{x} \cdot \bar{y} + \bar{y} \cdot z$$

with
(a) (10%) AND, OR, NOT gates
(b) (10%) AND, NOT gates

5. (10%) Let $G = (V, E)$ be a simple graph, and G contains two vertices with even degree. Please find the number of vertices with odd degree in the complement graph $\bar{G}$, and justify your answer.

6. Please give the combinatorial proofs of the following identities.

(a) (10%) $\binom{n+1}{k} = \binom{n}{k} + \binom{n}{k-1}$

(b) (10%) $\sum_{k=1}^{n} k \binom{n}{k} = n2^{n-1}$

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7. (10%) Please give the output of the following program in Python language.

```python
class Count:
    def __init__(self, count = 0):
        self.count = count

def increament(c, t):
    c.count += 1
    t += 1
    print(" (c, t) = (%d, %d) " % (c.count, t) )

c = Count()
t = 0
for i in range(3):
    increament(c, t)
```
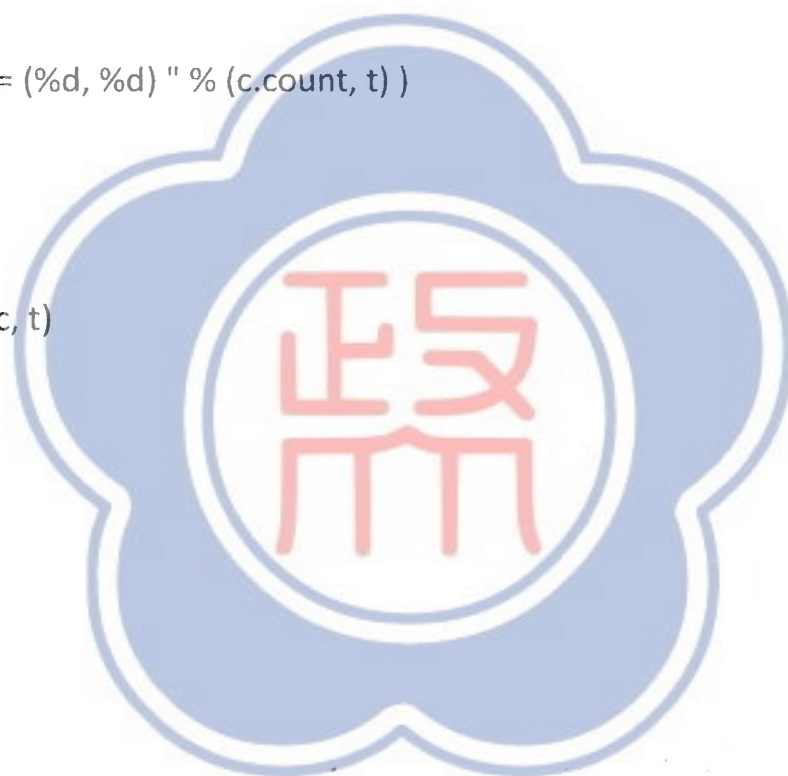
備　　　　註	一、作答於試題上者，不予計分。 二、試題請隨卷繳交。