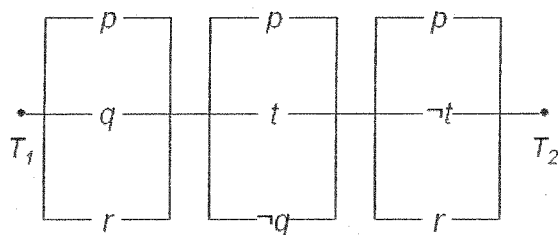


招生學年度	九十八	招生類別	轉學招生考試
系所班別	資訊工程學系三年級		
科目	離散數學		
注意事項	【禁止使用掌上型計算機】		

1. (10%) Prove that the square root of any prime number is irrational.
2. (10%) If one tosses a coin four times, what is the probability of getting two heads and two tails?
3. (10%) Prove that for all $n \in \mathbb{Z}^+, n > 3 \Rightarrow 2^n < n!$
4. (10%) Let $n \in \mathbb{Z}^+$. Prove that $\gcd(n, n+2) = 1$ or 2 . (**gcd**: the greatest common divisor)
5. (20%) Negate and simplify each of the following.
 - a) $\exists x[p(x) \wedge q(x)]$
 - b) $\forall x[p(x) \vee \neg q(x)]$
 - c) $\forall x[p(x) \rightarrow \neg q(x)]$
 - d) $\exists x[(p(x) \wedge q(x)) \rightarrow r(x)]$
6. (10%) For $n \geq 2$, suppose that there are n people at a party and that each of these people shakes hands (exactly one time) with all of the other people there (and no one shakes hands with himself or herself). How many handshakes occur among n people?
7. (10%) Simplify the following network.



8. (20%) Find the generating function for the sequence: $0, 2, 6, 12, 20, 30, 42, \dots, i+i^2, \dots$

Note: Do not just give the answer, explain it!

招生學年度	九十八	招生類別	轉學招生考試
系所班別	資訊工程學系三年級		
科目	資料結構		
注意事項	【禁止使用掌上型計算機】		

- (20%) Explain the following terms:
 - articulation point
 - stack
 - B-tree
 - stable sort
 - simple path
- (5%) What is a max heap?
 - (10%) What are the minimum and maximum numbers of elements in a heap of height h ?
 - (20%) Write an algorithm to construct a max heap from an array, moreover, the time complexity of your program should not exceed $O(n)$ (You should justify your answer).
- (8%) Assume we have two linked lists with first node pointed by head1 and head2 respectively. What would happen if we applied head1=head2 to these two lists?
- (15%) Write a pseudo code to visit a graph in depth first search order. Moreover, let V and E denote the number of vertices and edges in a graph, respectively. What are the time complexities of your algorithm if adjacency list is used to represent the graph.
- (10%) Use an example to illustrate how quick sort works. Moreover, what kinds of inputs will result in the worst case behavior?
- Use the hash function " $h(x) = x \bmod 19$ " to store the keys shown below in an array with 19 elements. 224562, 137456, 214562, 140145, 214576, 162145, 144467, 199645, 234534
Solve collisions by
 - (6%) Linear Open Addressing
 - (6%) Chaining

招生學年度	九十八	招生類別	轉學招生考試
系所班別	資訊工程學系二年級		
科目	計算機概論		
注意事項	【禁止使用掌上型計算機】		

1. (15 %) Write a program that calculates and prints the sum of the even integers from 2 to 100.
2. (10 %) Use recursion to write a function of factorial.
3. (10%) List four tasks for computer operation system.
4. (15%) List the main components of a computer, and briefly describe their functionality.
5. (50%, each 5%) Briefly explain the following terms.
 - (a) DNS server
 - (b) online auction
 - (c) WWW
 - (d) freeware
 - (e) packaged software
 - (f) CPU
 - (g) RFID
 - (h) OCT
 - (i) anti-spam program
 - (j) Trojan horse program