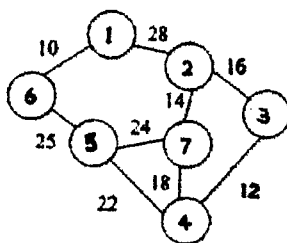


本試題是否可以使用計算機:  可使用,  不可使用 (請命題老師勾選)

- (10%) (1) How can we store sparse matrix by using array more efficiently? (2) Compare the advantage and disadvantages between the above way and the way by using the lined list.
- (10%) Given the undirected graph with cost shown in the following. Please show the state and the final results of Kruskal's algorithm and Prim's algorithm.



- (16%) Use the recursive method and the iterative method to represent the following equation:  
(Hint: Using C code or pseudo-code)

$$p = \frac{M * (M - 2) * \dots * (M - 2N)}{1 * 2 * 3 * \dots * (2N + 1)}$$

- (10%) Let  $f: Z^+ \rightarrow R$ , where  $f(n) = 3.4n^2 + n + 2.8$ , Choose correct statements in the following:

(a)  $f(n) = O(n)$ , (b)  $f(n) = O(n^2)$ , (c)  $f(n) = O(n^3)$ ,  
 (d)  $f(n) = \Omega(n)$ , (e)  $f(n) = \Omega(n^2)$ , (f)  $f(n) = \Omega(n^3)$ ,  
 (g)  $f(n) = \Theta(n)$ , (h)  $f(n) = \Theta(n^2)$ , (i)  $f(n) = \Theta(n^3)$ .

- (10%) Consider the array declaration  $A[1..20, 20..70, 1..15]$ , and this array is stored in row major order.

- (1) If  $A[10, 20, 1]$  is stored at address 2000, what is the location of  $A[8, 30, 10]$ ?
- (2) What is the array element at the location 2050?

- (20%) Given the binary search tree (BST), three traversals have been defined: *preorder*, *inorder*, and *postorder*. It returns the relative position of a node in the corresponding traversal. Given the following *preorder* traversal of a binary search tree

9 3 1 4 6 5 16 32 24 27

List the results of the other two traversals and draw the corresponding BST tree as well.

- (14%) Insert a sequence of keys (5 8 2 3 9 4 7 10 1 6) into an empty heap (max-heap). Show the heap trees step by step.
- (10%) How can we speed up the UNION and FIND operations by using the trees to represent sets?