

1. (10pt.) Write a routine in C language to fetch the m -th element of a singly linked list. You must consider empty or any other possible error cases.
2. (20pt.) Write a routine in C language to interchange the m -th and n -th elements of a singly linked list. You must consider empty or any other possible error cases.
3. (20pt.) The Taiwan Lotto 6/49 enables users to choose six numbers from one to forty-nine. Please use C programming language to write the following programs:
 - (a) Write a program to output a set of six random numbers chosen in this range.
 - (b) Write a program to enable users to input target n numbers in need, $0 \leq n \leq 6$.
 1. If n is smaller than six, output target n numbers and $(6-n)$ random numbers chosen by this program.
 2. If n is equal to six, directly output target n numbers.
4. In a packet switching system, the server uses the formula shown below to determine the priority of packets waiting for processing.

$$\text{Priority} = \frac{\text{Packet waiting time}}{\text{Packet length}}$$

Table 1 shows an example. The processing order of packets is Packet 2, Packet 3, Packet 1.

Packet ID	Packet waiting time (msec)	Packet length (bytes)	Priority
1	100	100	1
2	300	100	3
3	400	200	2

In order to write a program to determine a list of waiting packets in priority sequence, answer the following questions.

- (7 pt) (a) Use pseudocode to define data structures used in your program and explain your reason for such design.
 - (18 pt) (b) Use pseudocode to write a program to determine the list.
5. Consider a directed graph to represent a network. Answer the following questions.
 - (5 pt) (a) Use pseudocode to define a data structure for an adjacency matrix and explain your design.
 - (5 pt) (b) Draw three directed graphs-- G_1 , G_2 , and G_3 to give examples for a strongly connected graph, a weakly connected graph, and a disjoint graph. Each graph in your example should have at least 5 nodes. Use your definition in 5(a) to write the adjacency matrices of those examples.
 - (15 pt) (c) Given a directed graph G . Use pseudocode to write a program to determine if G is a strongly connected, weakly connected, or disjoint graph.