請照題號次序作答

Use C, C++ or Java programming language to design your computer programs.

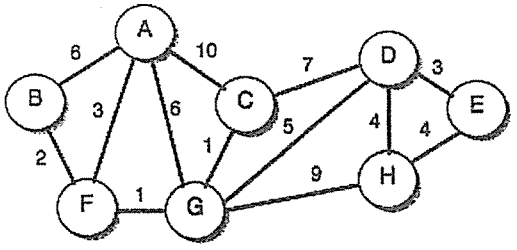
1. (20%) Given the polynomials of one single variable, e.q. $2x^3 + 5x + 1$.
   a. (10%) Design a data structure which can represent any polynomial of one single variable.
   b. (10%) Implement the function `poly_add(poly1, poly2)` and `poly_mul(poly1, poly2)` which can add/multiply two polynomials and return a new result polynomial.

2. (25%) Stack
   a. (10%) Define the structure and operations of a stack. The operations includes `push, pop, top, stackEmpty`.
   b. (5%) Please convert the following expression from **infix** form to **postfix**:
   x + y * z – (x + y) * z
   c. (10%) With your stack program, please write a program that can convert the arithmetic expression from infix from to postfix.

   The expressions consist of single character operands and 5 types of operators, including +, -, *, /, and parentheses (). The operator precedence of the expressions list as following table:

Priority	high	medium	low
Operators	()	* /	+ –

3. (20%) Given a connected undirected graph as the following.
   a. (5%) Please define the structure that can store the adjacency matrix in programming language.
   b. (10%) Write a program to find the MST(minimum-spanning tree) of the following graph, using Kruskal's algorithm.
   c. (5%) What is the total cost of the MST derived from the adjacency matrix table?



4. (20%)
   a. (10%) Design a heap-sort algorithm.
   b. (10%) Show the process of heap-sort step-by-step, while successively inserting the keys 41, 38, 31, 12, 19, 8, 27, 58, 23, 5.

5. (15%) Show the construction of the red-black trees step-by-step, while successively inserting the keys 41, 38, 31, 12, 19, 8, 27, 58, 23, 5.

試題隨卷繳回