Multiple Choice Problem Sample

Problem (Software Engineering Concepts)
Which of the following are correct statements about software qualities? Answer: A, B .

A. Software is **correct** if it satisfies functional specifications.
B. Software can be **maintainable** but not **reliable.**
C. Software is **robust** if it can be easily ported to different environments.
D. Software can be **correct** but not **reliable**.

Problem (Software Architecture)
Which category of design patterns does the observer design pattern belong to? Answer: C .

A. creational patterns
B. structural patterns
C. behavioral patterns
D. none of the above

Problem (Tech Presentations)
Which of the following describes the Unreal framework? Answer: B .

A. web server framework
B. game engine
C. database
D. web frontend engine

Short Answer Problem Sample

Problem (Software Production Process)
What are the three basic roles in Scrum?

Answer: Scrum master, product owner, and team member

Problem (Software Engineering Concepts)
Please list two aspects that make software engineering different from programming.

Answer: (i) Software engineering often requires a team to develop the software and (ii) the software often involves multiple versions.

Problem (Software Engineering Principles)
Give an example of one of the seven software engineering principles as applied to your course project.

Answer: N/A
Tip: consider the design, implementation, testing, as well as the development process.

Comprehensive Problem Sample

Problem (Theoretical Foundation of Testing)
Assume the following program is a correct implementation:

```
enum E = {NONE=-1, FQ=0, SQ=1, TQ=2, HQ=2};
E quartiles (int x)  {
   if (x==25) then
      return FQ;
   else if (x==50) then
      return SQ;
   else if (x==75) then
      return TQ;
   else if (x==100) then
      return HQ;
   else
      return NONE;
   end if;  end if; end if; end if;
}
```

Please indicate the input domain **D**, output domain/range **R**, and output requirement **OR**.

Answer:

$D = Z$

$R = \{-1, 0, 1, 2\}$

$OR = \{< 25, 0 >, < 50, 1 >, < 75, 2 >, < 100, 2 >\} \cup \{< i, -1 > | i \in Z \wedge i \neq 25 \wedge i \neq 50 \wedge i \neq 75 \wedge i \neq 100\}$

Problem (White-box Testing)
Consider the following program:

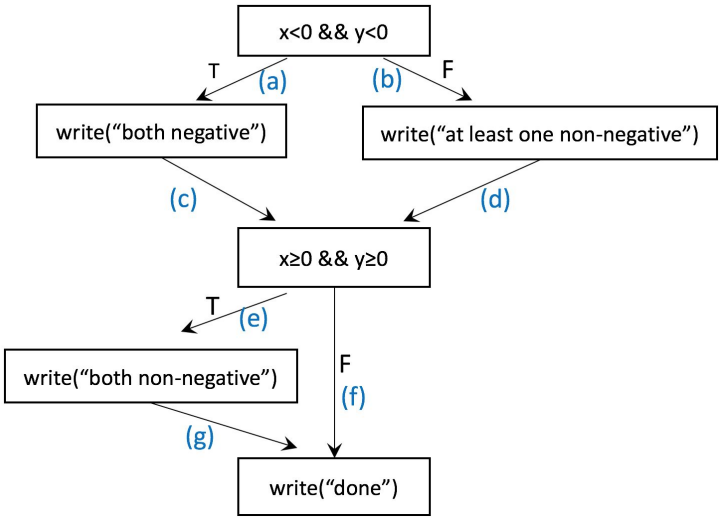
```
test_sign (int x, int y)
{
   if (x<0 && y<0)
      write ("both negative");
   else
      write ("at least one positive");

   if (x≥0 && y≥0)
      write ("none is negative");
   write("done");
}
```

1) Please indicate the input domain **D**;
2) Draw the control flow graph (CFG);
3) Give a minimal test set that ensures full *statement* coverage;
4) Label the edges in the CFG, then list all the *paths* in the CFG.
5) Is there a minimal test set that ensures full *path* coverage (all paths listed in 4)? If so, provide one; otherwise, explain the reasons.
Tips: draw a coordinate system to help figure out the ranges (areas) that satisfy the conditions of different branches.

Answer:

1) Input domain: $D = Z \times Z$

2) The control flow graph of the code is as follows:



3) A minimal test set that ensures full statement coverage is: {<-1, -1>, <1, 1>}

4) There are four paths:

Path 1: a → c → e → g

Path 2: a → c → f

Path 3: b → d → e → g

Path 4: b → d → f

5) There does not exist a minimal test set that ensures full path coverage, since Path 1 is infeasible.
(To cover the other three paths, a minimal test set could be {<-1, -1>, <1, 1>, <1, -1>})