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प्रज्ञानं ब्रह्म Manipal INSPIRED BY LIFE

Manipal Institute of Technology, Manipal (A Constituent Institute of Manipal University)



VII SEMESTER B.TECH (COMPUTER SCIENCE AND ENGINEERING)

END SEMESTER EXAMINATIONS, NOV/DEC 2015

SUBJECT: SOFTWARE TESTING AND ANALYSIS [CSE 421] REVISED CREDIT SYSTEM

Time: 3 Hours

DATE: 01-12-2015

MAX. MARKS: 50

Instructions to Candidates:

- ✤ Answer ANY FIVE FULL questions.
- ✤ Missing data, if any, may be suitably assumed.

1A. For the given program in Fig.Q.1.A, draw a CFG by considering each statement as a node [granularity is one]. Write the test cases for path coverage. 4M

1 procedure insert(a, b, n, x)
<pre>2 begin bool found := false;</pre>
3 for I:=1 to n do
4 if a[I]=x
5 then found := true; goto leave endif
6 enddo;
7 leave:
8 if found
9 then b[I]:=b[I]+1
<pre>10 else n:= n+1; a[n]:=x; b[n]:=1 endif</pre>
11 end insert

Fig.Q.1.A

1B. Write a program and show that mutation testing uncovers errors that path testing misses.Justify your answer by showing test cases generated by path testing and appropriate mutants.3M1C. Explain capture and replay with an example.3M

2A. Consider the example of withdrawing cash from an ATM machine. The process consists of the following steps:

- The customer will be asked to insert the ATM card and enter the PIN number.
- If the PIN number is valid, the withdrawal transaction will be performed:
 - The customer selects amount.
 - The system verifies that it has sufficient money to satisfy the request; then the appropriate amount of cash is dispensed by the machine and a receipt is issued.
 - $\circ~$ If sufficient amount is not available in the account, a message "Balance not sufficient" is issued.
- If the bank reports that the customer's PIN is invalid, then the customer will have to re-enter the PIN.

Draw a Statechart diagram and generate test cases to cover all states.5M2B. Why test oracles are required? With a neat diagram explain comparison based oracle.3M2C. What is scaffolding? What does scaffolding include?2M

3A. For the program given in Fig.Q.3A, Perform all the steps of mutation testing on the test suite $T = \{t1: < a=0\}, t2: < a=3\}$. First order mutants should be generated by replacing "==" with ">=" and "+" with "-". 3M

```
1. void MyMethod(int a) {
      int x = 1;
2.
3.
      while(true) {
4.
         a = a + x;
        if(x == 3)
5.
6.
            break;
7.
         x = x + 1;
      }
8.
      print(a);
   }
```

Fig.Q.3.A

3B. For the program given in Fig Q.3B, draw the CFG. Compute du pairs for all variables showing c-use and p-use. Generate test cases to test all du pairs. 4M

1. input(n);
2. int i, result=1;
3. for(i = 2; i <= n; i++) {
4. result = result * i;
 }
5. output n, result;</pre>

Fig.Q.3.B

3C. Write any six control faults that occurs when testing an implementation against a state machine. 3M

4A. A riffle salesperson in the former Arizona territory sold riffle locks, stocks and barrels made by a gunsmith in Missouri. Locks cost \$45, Stocks cost \$30 and barrels cost \$25. The sales person had to sell at least one complete riffle per month and production limits were such that the most a salesperson could sell in a month was 70 locks, 80 stocks and 90 barrels. After each town visit, the salesperson sent a telegram to the Missouri gunsmith with the number of locks, stocks and barrels sold in that town. The system uses locks=-1 to indicate end of input data. When the sales of the month were complete, the Gunsmith computes the salespersons commission as follows: 10% if sales are less than \$1000, 15% if sales are between \$1000 and \$1800 and 20% if the sales are above \$1800. The commission program produced a monthly sales report that gave the total number of locks, stocks and barrels sold, the salespersons total dollar sales and finally the commission.

- Construct Normal Boundary Value Analysis test cases.
- Identify the valid and invalid classes of the input variables. 4M

4B. For the scenario given in Q.4.A, Write the set of weak normal and weak robust test cases. 3M 4C. With an example for each, explain the various Integration Testing strategies. 3M

5A. Explain any five issues in testing OO software.
5B. Explain the steps in forming decision table. For the scenario given in Q.4A, Construct a decision table and derive the test cases.
5C. Write a program in which test cases of du path testing will be different from that of du pair testing.

6. Write short notes on	
(i) Test execution & Adequacy Criterion	2M
(ii) Verification & Validation	2M
(iii) Quality Assurance & Quality Control	2M
(iv) Alpha Testing & Beta Testing	2M
(v) Memory analysis	2M
