CS 5/7314: Software Testing & Quality Assurance

Sample Exam #2

Nov. 15, 2023

Student name: _____

Exam grade: _____

General Instructions

- This is a closed-book exam, but one summary sheet (8x11, letter sized, single or double sided) is allowed. Please turn your summary sheet in with your completed exam.
- Read exam questions carefully before answering them.
- There are three questions, totaling 50 points. The point distribution is shown by each question.
- Exam duration for on-campus students (& distance students taking the exam on campus): 75 minutes.
- Distance students:
  1. Exam start time: You may start anytime after 3:30pm, 11/15/2023.
  2. Exam duration: 90 minutes total, including 75 minutes for taking the exam and an extra 15 minutes to handle the uploading/submission/etc.
  3. Deadline for exam submission: 90 minutes after you start your exam & before 5pm, 11/17/2023.
  4. You need around 3 sheets of blank paper to write your answers (no pencils, please, to ensure readability of the scanned exam).
  5. Be sure to clearly identify question numbers.
  6. When you finish answering the questions, you need to scan your answers and upload it to Canvas for submission.
  7. When upload your completed exam for submission, please try to use a single file, if possible.
- **Good luck!**

I. Choose *one* best answer for each question ..... *(3 points each, 15 points total.)*

1. Match the following testing techniques to their classification:

i. BT based on implemented program logic/decisions	a. BBT
ii. Behavior-based FSM	
iii. Markov OP	b. WBT
iv. CFT based on software module flow-chart	
v. DFT/DDG based on external I/O	
vi. Musa OP	c. UBST

2. Mark true/false (T/F) for each of the following statements about EPC, Weak 1x1, Weak Nx1:
   a. BT is the most effective strategy in most cases.
   b. Weak 1x1 is the most effective strategy in most cases.
   c. Weak Nx1 is the most effective strategy in most cases.
   d. BT is the least costly strategy when a large number of variables are involved.
   e. Weak 1x1 is the least costly strategy when a small number of boundaries are involved.
   f. Weak Nx1 is the least costly strategy when a small number of boundaries are involved.

3. Consider the relationship between Markov OP and FSM:
   a. It is similar to that between CFT and DFT.
   b. It is similar to that between CFT and PT.
   c. It is similar to that between CFT and BT.
   d. It is similar to that between DFT and PT.
   e. It is similar to that between DFT and BT.
   f. It is similar to that between DFT and Musa OP.
   g. It is similar to that between Musa OP and PT.
   h. It is similar to that between Musa OP and BT.
   i. It is similar to that between Musa OP and CFT.

4. Consider model complexity as measured by the number of nodes+links in FSM, CFG, and DDG:
   a. FSM is usually the most complex.
   b. CFG is usually the most complex.
   c. DDG is usually the most complex.
   d. FSM is always the most complex.
   e. CFG is always the most complex.
   f. DDG is always the most complex.

5. Consider defect injection test (DIT) and mutation test (MT):
   a. DIT = MT.
   b. DIT is a special case of MT where each defect is a mutant.
   c. MT is a special case of DIT where defects to be injected are created from program mutations.
   d. DIT is based on FSM while MT is based on Partitions.
   e. MT is based on FSM while DIT is based on Partitions.
   f. All of the above.
   g. None of the above.

II. Testing Techniques: Comparison ..... *(8 points each, 16 points total)*

1. Draw a 2d region (and its boundaries) of your choice, and compare the effectiveness and cost of EPC and Weak 1x1 BT strategies.

2. Starting with a simple Markov OP example of your choice, convert it to the corresponding Musa OP. (Make necessary assumptions as needed.)

III. Testing ..... *(19 points total)*

1. A software calculates X value through an iterative procedure (loop-like implementation is assumed). Then a binary decision is made to accept X as the output if ($L < X < U$), otherwise -1 will be the output. Construct your CFG and DDG, outline your testing strategies, determine the number of test cases and sensitize at least one of them for each testing technique.
   (Make necessary assumptions as needed, especially for DDG construction.)