Mid-term Review

CSE 4495 - Lecture 6 - 02/08/2022

Instructor : Md. Mohaiminul Islam

Question 1

1. A program may be correct, yet not reliable.
   a. True
   b. False
2. If a system is on an average down for a total 30 minutes during any 24-hour period:
   a. Its availability is about 98% (approximated to the nearest integer)
   b. Its reliability is about 98% (approximated to the nearest integer)
   c. Its mean time between failures is 23.5 hours
   d. Its maintenance window is 30 minutes

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   a. **True**
   b. False
2. If a system is on an average down for a total 30 minutes during any 24-hour period:
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Question 1

3. Category-Partition Testing technique requires identification of:
    - Parameter characteristics
    - Representative Values
    - Def-Use pairs
    - Pairwise combinations
4. Validation activities can only be performed once the complete system has been built.
    - True or False

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    - **Parameter characteristics**
    - **Representative Values**
    - Def-Use pairs
    - Pairwise combinations
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Question 1

5. A system that fails to meet its user's needs may still be:
   - Correct with respect to its specification.
   - Safe to operate.
   - Robust in the presence of exceptional conditions.
   - Considered to have passed verification.

Question 1

5. A system that fails to meet its user's needs may still be:
   - **Correct with respect to its specification.**
   - **Safe to operate.**
   - **Robust in the presence of exceptional conditions.**
   - **Considered to have passed verification.**

Question 2

You are building a web store that you feel will unseat Amazon as the king of online shops. Your marketing department has come back with figures stating that - to accomplish your goal - your shop will need an availability of at least 99%, a probability of failure on demand of less than 0.1, and a rate of fault occurrence of less than 2 failures per 8-hour work period.

You have recently finished a testing period of one week (seven full 24-hour days). During this time, 972 requests were served to the page. The product failed a total of 64 times. 37 of those resulted in a system crash, while the remaining 27 resulted in incorrect shopping cart totals. When the system crashes, it takes 2 minutes to restart it.

Question 2

Want: availability of at least 99%, a probability of failure on demand of less than 0.1, and a rate of fault occurrence of less than 2 failures per 8-hour work period.

Currently: 972 requests. The product failed a total of 64 times (37 crashes, 27 incorrect computations). It takes 2 minutes to restart.

- What is the rate of fault occurrence?

Question 2

Want: availability of at least 99%, a probability of failure on demand of less than 0.1, and a rate of fault occurrence of less than 2 failures per 8-hour work period.

Currently: 972 requests. The product failed a total of 64 times (37 crashes, 27 incorrect computations). It takes 2 minutes to restart.

- What is the rate of fault occurrence?
- **64/168 hours = 0.38/hour = 3.04/8 hour work day**

Question 2

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- What is the probability of failure on demand?

Question 2

Want: **availability** of at least 99%, a **probability of failure on demand** of less than 0.1, and a **rate of fault occurrence** of less than 2 failures per 8-hour work period.

Currently: 972 requests. The product failed a total of 64 times (37 crashes, 27 incorrect computations). It takes 2 minutes to restart.

- What is the probability of failure on demand?
- **64/972 = 0.066**

Question 2

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Currently: 972 requests. The product failed a total of 64 times (37 crashes, 27 incorrect computations). It takes 2 minutes to restart.

- What is the availability?

Question 2

Want: availability of at least 99%, a probability of failure on demand of less than 0.1, and a rate of fault occurrence of less than 2 failures per 8-hour work period.

Currently: 972 requests. The product failed a total of 64 times (37 crashes, 27 incorrect computations). It takes 2 minutes to restart.

- What is the availability?
- **It was down for (37*2) = 74 minutes out of 168 hours = 74/10089 minutes = 0.7% of the time. Availability = 99.3%**

Question 2

Want: availability of at least 99%, a probability of failure on demand of less than 0.1, and a rate of fault occurrence of less than 2 failures per 8-hour work period.

Currently: 972 requests. The product failed a total of 64 times (37 crashes, 27 incorrect computations). It takes 2 minutes to restart.

- Is the product ready to ship? If not, why not?

Question 2

Want: availability of at least 99%, a probability of failure on demand of less than 0.1, and a rate of fault occurrence of less than 2 failures per 8-hour work period.

Currently: 972 requests. The product failed a total of 64 times (37 crashes, 27 incorrect computations). It takes 2 minutes to restart.

- Is the product ready to ship? If not, why not?
- **No. Availability, POFOD are good. ROCOF is too high. How would you improve it?**

Question 3

- The airport connection check is part of a travel reservation system. It checks the validity of a single connection between two flights in an itinerary.
  - If the arrival airport of Flight A differs from the departure airport of Flight B, the connection is invalid.
  - If the departure time of Flight B is too close to the arrival time of Flight A, the connection is invalid.
  - If an airport doesn’t exist, the connection is invalid…

Question 3

`validConnection(Flight FlightA, Flight FlightB)`
`returns ValidityCode`

A Flight is a data structure consisting of:

- A unique identifying flight code (string, three characters followed by four numbers).
- The originating airport code (three character string).
- The scheduled departure time (in universal time).
- The destination airport code (three character string).
- The scheduled arrival time (in universal time).

Question 3

There is also a flight database, where each record contains:

- Three-letter airport code (three character string).
- Airport country (two character string).
- Minimum connection times (integer, minimum number of minutes that must be allowed for flight connections).

`ValidityCode` is an integer with value:

- 0 for OK
- 1 for invalid airport code
- 2 for a connection that is too short
- 3 for flights that do not connect (arrivingFlight does not land in the same location as departingFlight)
- 4 for any other errors (malformed input or any other unexpected errors).

Parameter: Arriving flight

Flight code:
- ***malformed***
- ***not in database***
- ***valid***

Originating airport code:
- ***malformed***
- ***not in database***
- ***valid city***

Scheduled departure time:
- ***syntactically malformed***
- ***out of legal range***
- ***legal***

Destination airport (transfer airport):
- ***malformed***
- ***not in database***
- ***valid city***

Scheduled arrival time (tA):
- ***syntactically malformed***
- ***out of legal range***
- ***legal***

Parameter: Departing flight

Flight code:
- ***malformed***
- ***not in database***
- ***valid***

Originating airport code:
- ***malformed***
- ***not in database***
- ***differs from transfer airport***
- ***same as transfer airport***

Scheduled departure time:
- ***syntactically malformed***
- ***out of legal range***
- ***before arriving flight time (tA)***
- ***between tA and tA + minimum connection time (CT)***
- ***equal to tA + CT***
- ***greater than tA + CT***

Destination airport code:
- ***malformed***
- ***not in database***
- ***valid city***

Scheduled arrival time:
- ***malformed***
- ***out of legal range***
- ***legal***

Parameter: Database record

This parameter refers to the database record corresponding to the transfer airport.

Airport code:
- ***malformed***
- ***blank***
- ***valid***

Airport country:
- ***malformed***
- ***blank***
- ***invalid (not a country)***
- ***valid***

Minimum connection time:
- ***malformed***
- ***blank***
- ***invalid***
- ***valid***

Question 4

Allow Content to Load	Notify About Pop-Ups	Allow Cookies	Warn About Add-Ons	Warn About Attack Sites	Warn About Forgeries
Allow	Yes	Allow	Yes	Yes	Yes
Restrict	No	Restrict	No	No	No
Block		Block			

- Full set of test specifications = 144 tests
- Create a covering array covering all pairwise combinations.

Question 4

Allow Content	Allow Cookies	Pop-Ups	Add-Ons	Attacks	Forgeries
Allow	Allow	Yes	Yes	Yes	Yes
Allow	Restrict	No	No	Yes	No
Allow	Block	No	No	No	Yes
Restrict	Allow	Yes	No	No	No
Restrict	Restrict	Yes	-	-	Yes
Restrict	Block	No	Yes	Yes	No
Block	Allow	No	-	-	Yes
Block	Restrict	-	Yes	No	-
Block	Block	Yes	No	Yes	No

Thank You