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ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
Department of Computer Science and Engineering (CSE)

SEMESTER FINAL EXAMINATION   SUMMER SEMESTER, 2021-2022
DURATION: 3 HOURS   FULL MARKS: 150

SWE 4603: Software Testing and Quality Assurance

Programmable calculators are not allowed. Do not write anything on the question paper.
Answer **all 6 (six)** questions. Figures in the right margin indicate full marks of questions whereas corresponding CO and PO are written within parentheses.

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1. a) Define system bottleneck and explain how performance testing can detect these in any software system.

   7
   (CO2)
   (PO1)

   b) Foodly v2.0, a food delivery app, will be released in the next month or so. This app is currently using an API, which recently released a beta version. So, the testers are engaged in testing their app's compatibility with the API.

   Explain the type of compatibility testing that is being performed by the testers.

   5
   (CO3)
   (PO2)

   c) Foodly v2.0 has several features, such as restaurant search and filter, order, payment and real-time tracking. The development and testing phases have been completed, and the application has been deployed to the production environment. However, you have found two bugs that the digital payment is not working and order history is not correctly listed. A developer has fixed the issues but you want to ensure that the fix has not introduced any new defects.

   4 +
   4 + 5
   (CO1)
   (PO2)

   i. Explain how you would perform the smoke testing on the Foodly app after the fixes have been completed.

   ii. Mention the modules that need to be tested for performing sanity testing.

   iii. Discuss how you would use regression testing technique to ensure that the fix for the fund transfer feature has not introduced any new defects, while minimizing the time and effort spent on retesting.

2. a) Briefly explain the principles of security testing that need to be verified with examples.

   7
   (CO3)
   (PO1)

   b) Consider the program given in Code Snippet 1:

   4 × 3
   (CO2)
   (PO2)

```
1   function TriangleType(i ,j, k){
2       let returnMessage="Not Triangle"
3       if(((i+j)>k) && ((j+k)>i) && ((k+i)>j)){
4           if((i+j+k)==3*i)
5               returnMessage="Equilateral"
6           else
7               if((i!=j) && (j!=k) && (k!=i))
8                   returnMessage="Scalene"
9               else
10                  returnMessage="Isosceles"
11      }
12
13      return returnMessage
14  }
```

Code Snippet 1: TriangleType function for Question 3.b)

    i. Draw the control flow diagram for the code.

    ii. Calculate the complexity of the program using connection matrix.

    iii. List all independent paths.

c) "100% p-use coverage gives 100% condition coverage"- Do you agree with this statement Justify your answer with a proper example.

3.   a) Differentiate between dynamic and static anomaly detection with proper examples.

          (CO3)
          (PO1)

  b) Discuss the importance of Test Log and Test Summary Report in software testing phase.

          7
          (CO1)
          (PO1)

  c) Perform top-down and bottom-up integration procedure from the system hierarchy given in Figure 1.

          4 + 4
          (CO2)
          (PO2)
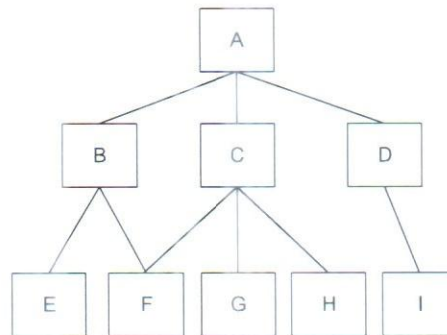
Figure 1: Decomposition Tree for Question 2.c)

  d) Explain why regression testing is problematic in larger software systems.

          (CO3)
          (PO2)

4.   a) ABC Software Inc. is a company that specializes in developing enterprise software solutions for its clients. At ABC Software Inc., the software development process is well-defined and documented, and all team members follow the same process. The organization has implemented statistical process control to monitor and control the software development process. Different charts are used to track key performance indicators (KPIs) such as schedule variance, defect density, and effort variance. Also, they use predictive modeling to forecast project outcomes based on historical data.

          2 + 4
          (CO4)
          (PO2)

    i. Identify the Capability Maturity Model (CMM) Maturity Level of ABC Software Inc.

    ii. Discuss why you think this organization falls under the specific maturity level.

  b) Assume you have recently joined as a test engineer in ABC Software Inc. and you have been assigned to do performance testing on a digital banking app called "UCash". This app has several features, such as account balance inquiry, fund transfer, bill payment, and account statement generation.

          (CO2
          (PO1

    Discuss the steps you would take to perform performance testing on "UCash".

  c) Briefly discuss how a backlog of any project can be measured for tracking the progress.

          (CO3
          (PO1

d) The module implementation details of a software project are given in Table 1. 3×3
(CO2)
(PO1)

Table 1: Module implementation details for Question 4.d)

Module	Unique Operands	Unique Operators	Total Operands	Total Operators
A	23	12	41	43
B	34	12	34	54
C	12	23	37	56

Calculate the Halstead effort for all the modules and rank them in descending order.
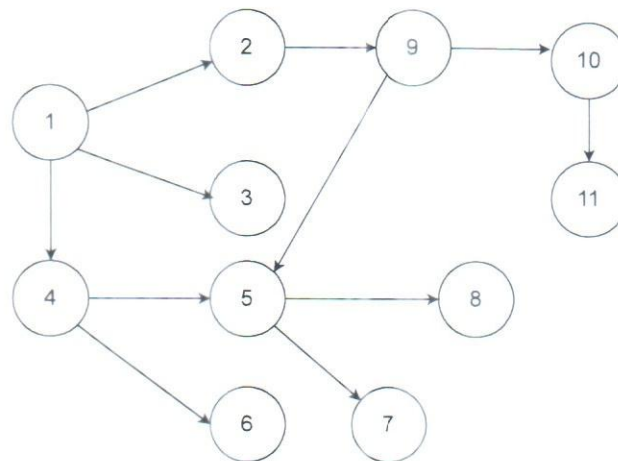
5. a) Differentiate between: 3×2
  i. Function Testing and System Testing (CO3)
  ii. Alpha Testing and Beta Testing (PO2)

b) Calculate the number of test sessions for the pairwise and neighborhood call graph based 7
integration testing for the call graph shown in Figure 2. (CO2)
(PO1)

Figure 2: Call Graph for Question 5.b)

c) Consider a project having function points of 732, with bug log report shown in Table 2. 4×3
(CO2)
Table 2: Bug log report for Question 5.c) (PO1)

Bug reference ID	Bug Opening Date	Bug Closing Date
In testing phase		
M01-01	09-10-2023	10-10-2023
M01-02	12-10-2023	15-10-2023
M01-03	11-10-2023	13-10-2023
M01-04	13-10-2023	15-10-2023
M01-05	15-10-2023	20-10-2023
After deployment phase		
M02-01	15-11-2023	16-11-2023
M02-02	18-11-2023	21-11-2023
M02-03	30-11-2023	2-12-2023
M02-04	17-12-2023	19-12-2023
M02-05	18-12-2023	18-12-2023
M02-06	21-12-2023	25-12-2023

Calculate the values of -
  i. Defect spoilage
  ii. Defect density
  iii. Defect removal efficiency

6. a) Explain the S-curve of total failure vs development time in days shown in Figure 3 and discuss the action that needs to be performed to make the actual curve identical to the theoretical one.
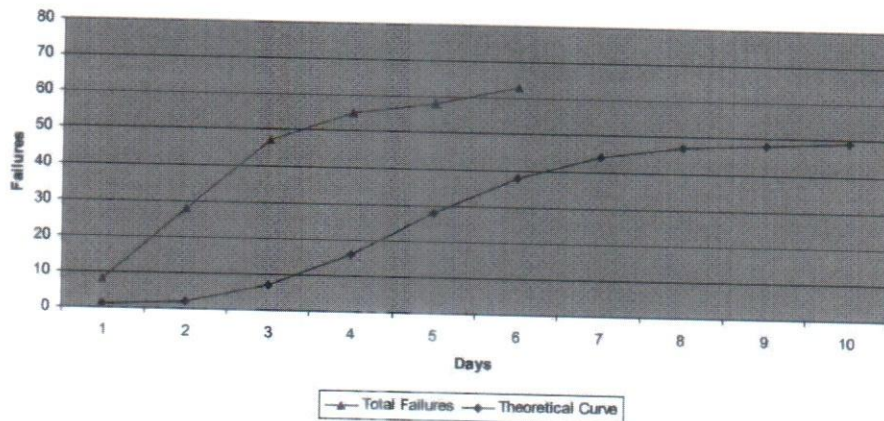
(CC
(PC

Figure 3: S-curve for total failure vs development time for Question 6.a)

b) A SafeHome system diagram is illustrated in Figure 4. The system requires significant (4) end-user efficiency, moderate (2) distributed data processing, essential (5) data communications, and other GSCs are incidental (1). Consider the weights of system components (ILF, EIF, EI, EO, and EQ) are 10, 15, 6, 7, and 8 respectively.
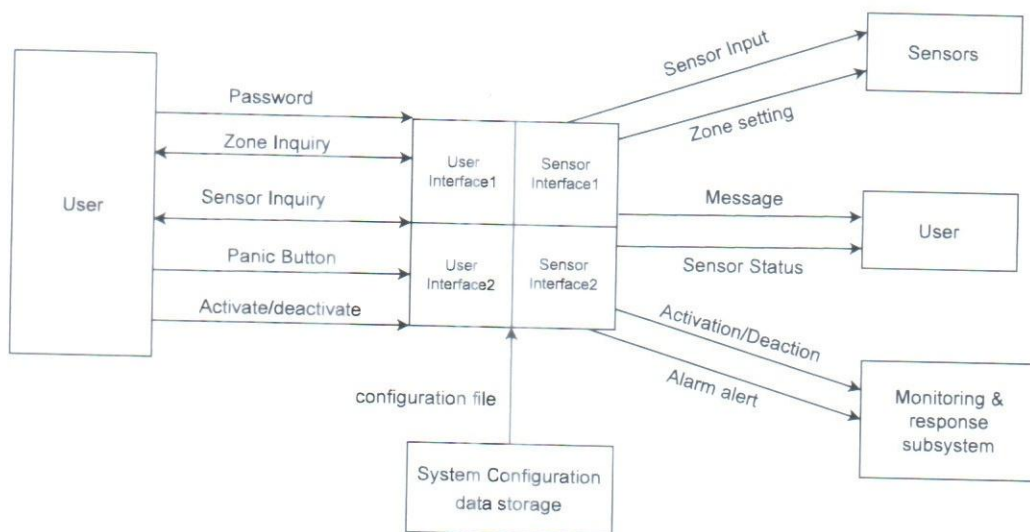
(CO
(PO

Figure 4: SafeHome System High Level Design for Question 6.b)

Compute the function points using FPA.

c) Using the function point in Question 6.b), calculate the following values:
  i. Total number of test cases
  ii. Total number of acceptance test cases
  iii. Test Coverage
  iv. Defect Density

2×4
(CO2
(PO1