Jahangirnagar University
Department of Computer Science and Engineering
Fourth Year Second Semester B.Sc. (Hons.) Final Examination -2022

Course Title: Software Quality Assurance **Course No: CSE-455**
Full Marks: 60 **Time: 3 Hrs.**

[Answer each of the following questions. Each question carries equal marks. Figures in the right margin indicate marks.]

1. **Answer all questions:**
   a) How do you define software quality and software quality assurance? 2
   b) Define control flow graph (CFG) in white box testing. 2
   c) Select the most appropriate answer(s): 2

i) A test case may consist of _____ a) a set of inputs conditions b) no execution c) expected output options d) all the above	ii) Testing will end when _____ a) Customer is confident that the system meets stated requirements b) Testing budget is not exhausted c) System exhibits an unacceptable level of quality d) All the above options
iii) Which is/are developer testing? a) unit testing b) system testing c) module testing d) acceptance testing	iv) Testing is _____ a) creating program code b) finding the defect c) finding and correcting defect d) none of the option

   d) Explain the term " Software Quality cost". 2
   e) What do you mean by Test Driven Development (TDD)? 2
   f) Why README files are necessary? 2

2. Answer **Any Three** out of **Four** questions:
   a) "SQA must address development, operations, and maintenance". What will be your comment on this statement? 4
   b) Briefly explain **RIPR** model (fault and failure model in software testing). 4
   c) Explain Test Criterion and Test Requirements (TR) in testing with example. 4
   d) To compare the different active clause coverage, please tick mark the cells that satisfy the specified criteria in the following table: 4

Criterion	Major clause determines p	Major clause changes value	Changing major clause changes p	Minor clauses are held the same
GACC	✓	✓		
CACC	✓	✓	✓	✓
RACC	✓	✓	✓	✓

Here, GACC = General Active Clause Coverage, CACC = Correlated Active Clause Coverage and RACC = Restricted Active Clause Coverage

3. Answer **Any Three** out of **Four** questions:

a) Answer the following questions for this faulty program. 4

i. Explain what is wrong with the given code. Describe the fault precisely by proposing a modification to the code.

ii. If possible, give a *test case* that *does not execute the fault*. If not, briefly explain why not.

iii. If possible, give a *test case* that executes the *fault, but does not result in an error state*. If not, briefly explain why not.

iv. If possible, give a *test case* that results in an *error state*

```
/**
 * Sum values in an array
 *
 * @param x array to sum
 *
 * @return sum of values in x
 * @throws NullPointerException if x is null
 */
1. public static int sum(int[] x)
2. {
3.    int s = 0;
4.    for (int i=0; i < x.length; i++)
5.    {
6.       s = s - x[i];
7.    }
8.    return s;
9. }
```

b) Write comments on Test automation and Test postmortem for software testing environment. 4

c) i) Does predicate coverage subsumes clause coverage? Explain with an example. 4

ii) Draw the block diagram of MDTD (Model Driven Test Design)

d) **Determine** the equivalence partition for phone numbers having the following format: 4

Area Code (XXXX) Prefix (XXX) - Suffix (XX)

Area code: 4 digits number not beginning with last two digits of your Exam Roll and 54

Prefix: 3 digits number except last two odd numbers and second last even numbers

Suffix: 2 digits number except all the prime numbers not beginning with 1 and also with in the range from 1 to 30.

4. Answer **Any Three** out of **Four** questions:

a) **Correlate** Boundary Value Analysis method with Equivalence Partition method in Black box testing with example. 4

b) The nonfunctional requirements are sometimes referred to as "non-behavioral requirements" or "software quality attributes"- Is this statement correct? Explain your thoughts. 4

c) **Analyze** the following characteristics and blocks for the questions below: 4

Characteristics	Block 1	Block 2	Block 3	Block 4
Value 1	< 0	0	> 0	
Value 2	< 0	0	> 0	
Operation	+ -	-	×	÷

i) Write down the test cases to satisfy the Each Choice criterion.

ii) Write down the test cases to satisfy the Base Choice criterion. Assume base choices are **Value 1 => 0, Value 2 => 0,** and **Operation = +.**

iii) How many test cases are needed to satisfy the Pair-wise Coverage criterion?

iv) How many test cases are needed to satisfy the all combination coverage (ACC)?

d) **Reflect** your experience on the *unit testing* tools used in the project work of CSE-455 and how TDD (Test Driven Development) differs from traditional testing. 4

5. Answer **Any Two** out of **Three** questions:

a) The software project for JU will incorporate registration, hall fee payment, and hall services provisions which require an initial investment of BDT24,30,000 to develop. 6

What is the environment for which SQA methods are developed for software system development? Based on the answer of the question, what are the seven environments for JU hall management system must consider. Elaborate your answer in context to the system.

b) Consider a function **nextDate (int month, int day, int year)** which takes three integer parameters to compute the next day in in mm/dd/yyyy format. For example, given 2/28/2019 the **nextDate** function will return 3/1/2019 and when given 6/14/1996, the **nextDate** function will return 6/15/1996. Now, answer the following questions regarding input space partitioning test cases for the **nextDate** function: 6

i. Apply interface-based approach for input domain modeling.

ii. Apply functionality-based approach for input domain modeling.

iii. Choose any Characteristic criteria from (i) and apply **Base Choice Coverage** to show all the possible test cases.

c) Consider the following predicate: $p = \neg a \vee (\neg b \vee c)$. 6

i. Determine the conditions under which each of the clause a, b and c, determines the predicate p are p_a, p_b and p_c, respectively.

ii. List all pair of rows from your table that satisfy Restricted Active Clause Coverage (**RACC**) with respect to each clause i.e. clause a, b and c.

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ID: 338

CSE 455 **Quiz-2** **Time: 25 minutes**

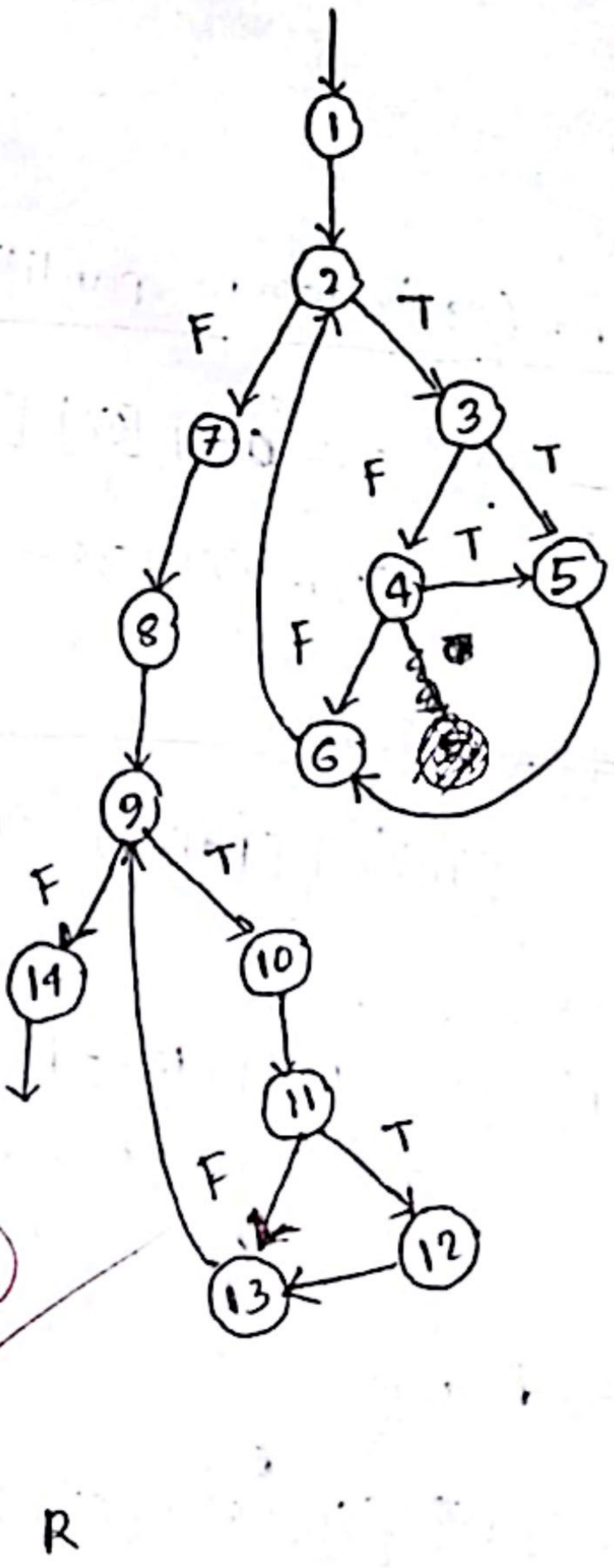
[10 points]

Question 1

Find cyclomatic complexity of the following source code:

```
public static void computeStats (int [ ] numbers)
{
  int length = numbers.length, i;
  double med, var, sd, mean, sum, varsum;
  sum = 0;  i = 0;
  while (i < length)
  {
    if(i!=15 || (i%2==0))
      sum += numbers [ i ];
    i++;
  }
  med = numbers [ length / 2 ];
  mean = sum / (double) length;
  varsum = 0;
  for (int i = 0; i < length; i++)
  {
    varsum = varsum + ((numbers [ i ] - mean) * (numbers [ i ] - mean));
    if(i!=15)
      System.out.println ("mean: " + mean);
  }
  var = varsum / ( length - 1.0 );
  sd = Math.sqrt ( var );
  System.out.println ("median: " + med);
  System.out.println ("variance: " + var);
  System.out.println ("standard deviation: " + sd);
}
```

CFG



∴ Cyclomatic complexity = R

= 6

Question 2: **[10 points]**

Find the equivalence partition for the security PIN having the following format:

Prefix (XX) Secret Code (XX) - Suffix (XXX)

7, 11, 13

Prefix: 2 digits number except 17 - 24, 31 - 37 and the prime numbers between 06 to 15.

Suffix: (Optional) 3 digits number not beginning with 12 and 35

Secret code: 2 digits number except those numbers where the ending digit is 3

Prefix (equivalence partition)

[-∞ - (-1)] [00 - 06] [07] [08 - 10] [11] [12] [13] [14 - 16] [17 - 24] [25 - ∞]
I V I V I V I V I V

[31 - 37] [38 - 99] [100 - ∞]
I V I

Suffix - Present

[True] [False]

9

Suffix

[-∞ - (-1)] [000 - 119] [120 - 129] [130 - 349] [350 - 359] [360 - 999] [1000 - ∞]
I V I V I V I

Secret code

[-∞ - (-1)] [00 - 02] [03] [04 - 12] [13] [14 - 29] [23] [24 - 32]
I V I V I V I V

[33] [34 - 42] [43] [44 - 52] [53] [54 - 62] [63]
I V I V I V I

[64 - 72] [73] [74 - 82] [83] [84 - 92] [93] [94 - 99]
V I V I V I V

[100 - ∞]
I

10

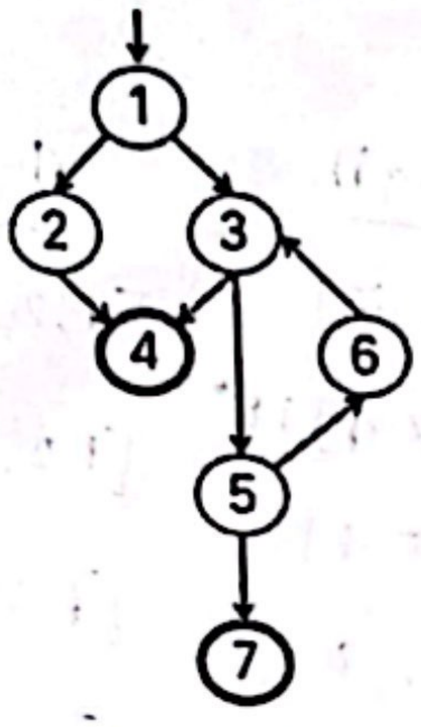
CSE 455 **Quiz-3** **Time: 25 minutes**

Roll: 338 **Name:** Shreya Nag Riya

Question 1 **[10 points]**

1. If a variable x is a formal parameter of a method, then it is considered as def of x. (use / def)

2. Which of the following paths is not a simple path for the following graph?



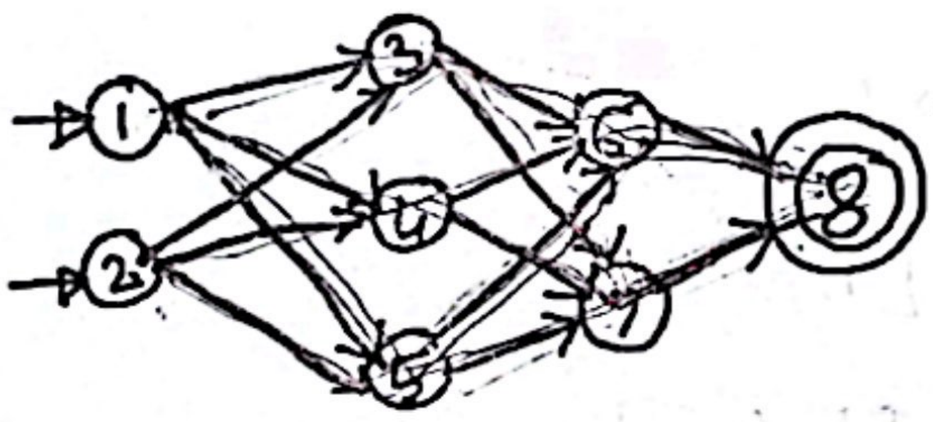
a) [3,5,6,3]
b) [5,6,3,4]
c) [5,6,3,5]
d) [6,3,5,7]
e) [3,5,6,3,4]

3. Suppose, while doing ISP you have identified 4 characteristics and partitioned them into {2,2,3,5} blocks. Now for Each Choice Coverage(ECC) there will be at least 5 test cases.

4. Suppose, while doing ISP you have identified 3 characteristics and partitioned them into {3,2,3}blocks. Now for Base Choice Coverage(BCC) there will be at least 6 test cases.

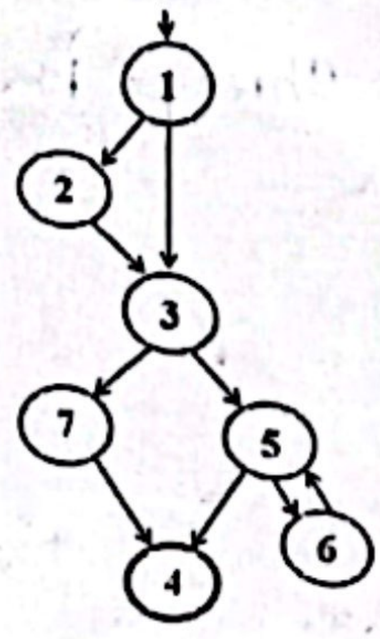
2+1+2+1

5. How many test paths are present in the following graph?



a) 6
b). 8
c) 12
d) 18
e) 24
f) 28

6. **Find the prime paths from the following graph:**



0-length

[1]
[2]
[3]
[4] !
[5]
[6]
[7]

1-length

[1,2]
[2,3]
[1,3]
[3,7]
[3,5]
[7,4] !
[5,4] !
[5,6]
[6,5]

2-length

[1,2,3]
[2,3,7]
[2,3,5]
[1,3,7]
[1,3,5]
[3,7,4] !
~~[3,7,5]~~
[3,5,4] !
[3,5,6]
[5,6,5] ✓
[6,5,6] ✓
[6,5,4] ! ✓

3-length

[1,2,3,7]
[2,3,7,4] ! ✓
[2,3,5,4] !
[1,3,7,4] ! ✓
[1,3,5,4] ! ✓
[1,2,3,5]
[2,3,5,6]
[1,3,5,6] ✓

4-length

[1,2,3,7,4] ! ✓
[1,2,3,5,4] ! ✓
[1,2,3,5,6] ✓

There are 9 prime paths :

[1,2,3,7,4]
[1,2,3,5,4]
[1,2,3,5,6]
[1,3,7,4]
[1,3,5,4]
[1,3,5,6]
[5,6,5]
[6,5,6]
[6,5,4]

2