M.Sc. Semester I Examination 2021
Computer Science
Paper MCSC-14 (Software Engineering)
F.M. : 40 **Time: 3 hours**

Answer the question no. 1 and any 4 from the rest.

1. Answer the following questions(any eight) : 1x8=8

i. Differentiate between a program and a software product.
ii. Distinguish between validation and verification.
iii. What is the significance of cyclomatic complexity V(G)=1?
iv. What do you mean by feasibility study of a project?
v. What is the aim of software engineering?
vi. Distinguish between Alpha Testing and Beta Testing.
vii. What are various types of Risks in software Engineering?
viii. Explain fault and failure
ix. Distinguish between free software and open source software.

2. Define various Halstead Software metrics.
Consider the following programming code :

```
main ( ) {
int a,b,c,avg;

scanf ( "%d,%d,%d"; &a, &b, &c);
avg a+b+c)/3;
printf ( " avg=%d", avg);
}
```

i. Calculate the number of unique operators and operands of the above program segment.

ii. Calculate the following Halstead Software metrics for the above programming code:

Program length, Vocabulary size, Program Volume, Difficulty Level, Effort. 2+1+5=8

3. Briefly explain the nature of important classes of Softwares according to CoCoMo.
   Give the empirical expression for the Estimation of Development Effort and time for each of the above classes.

Assume that the size of an Organic Software product has been estimated to be 50, 000 lines of code. Estimate the effort and development time for the software. (3x2)6 +2=8

4. How mutation testing is performed?
   What are dead and alive mutants ?

Consider following program segment:

```
10      READ A,B
        IF (A.EQ.-1) GO TO 11
        IF((A+B).LE.3) GO TO 12
        C=(A+B)**2
        GO TO 14
    12  C=(A+B)**3
    14  PRINT A,B,C
        GO TO 10
    11  STOP
        END
```

Define two mutants : Mutant1: GE in case of LE, Mutant2: EQ in case of LE
Explain the Analysis. 2+2+4=8

5. What is cyclomatic complexity of a Control Flow Graph(CFG)? What are the characteristics of cyclomatic complexity? What do you understand by linearly

independent path in flow graph? How is it related to Cyclomatic complexity?

Consider the following software code: Draw the control flow graph and calculate the cyclomatic complexity using different methods. Establish how the cyclomatic complexity is related to the number of predicate nodes of the CFG?

```
int compute_gcd(int x, int y)
{
  while (x!=y)
{
 if (x>y) then
 x=x-y;
 else y=y-x;
  }
 return x;
}
```

2+4+1=8

6. Discuss the advantages and disadvantages of classical waterfall model.

How are the disadvantages of classical waterfall model overcome in iterative waterfall model?

What do you mean by a prototype of a software and how it is developed?

"A software is to be developed whose budget and schedule is very tight" -- which model is best suited? Explain. 2+2+2+2=8

7. What is an SRS document? Why is it so important? What are the features of a good SRS document?
   What are the various attributes of a quality Software? Explain each of these briefly. 1+1+3+1+2=8

8. What the various phases of Software testing?

What are the differences between Black Box and White Box Testing? Explain with a suitable example.

Describe briefly the Top-down, Bottom-up and Sandwich testing approaches. Which one is more powerful and why?

2+2+3+1=8