ark: 20

Software Metrics TT 01

Time

1. Your friend wants you to define and collect metrics for him/her. He/She is responsible for **system test** What decisions might she/he need to make? What might be some reasonable metrics?

2. Suppose you have a sample for the number of defects in different modules. They are 10, 20, 15, 18, and 22. Calculate the mean, SD, and IV for the number of defects per module.

3. Explain why the duration of processes is measurable on a ratio scale. Give some example measures and the admissible transformations that can relate them.

4. Explain why it is wrong to assert that lines of code are a bad software measure.

5. Suppose your development team has as its goal "improve the effectiveness of testing." Use the GQM approach to suggest several relevant questions and measures that will enable you to determine if you ha met your goal.

$D = \text{Variance} = \Sigma D^2 / n$

$SD = \sqrt{\text{Variance}}$

$IV = \frac{SD}{\text{mean}}$

Shahjalal University of Science and Technology
Institute of Information and Communication Technology (IICT)
3rd year 2nd Semester Final Examination - 2021
Session—2018-19 Course No.—SWE 331
Course Title—Software Usability & Metrics
Time—2 Hours Credit: 2.00 Total Marks#50

Part A

1. Answer the following Questions (Any Five). $5 \times 1 = 5$

   (a) What is CMMI?

   (b) For a normal distribution, one σ (one standard deviation above and below the mean) includes 80% of the population - true or false.

   (c) A metrics program is defined by GQM with bottom-up approach - true or false.

   (d) How many types of measurement models are there? State the names.

   (e) What is 'Death March'?

   (f) How to measure 'Effort' according to *Algorithmic model*?

   (g) The mean is a valid measure of central tendencies for a metric using the ordinal scale - true or false.

2. Answer the following Questions (Any Four). $4 \times 2.5 = 10$

   (a) Define different measurement scale types along with the ways for measuring of central tendency.

   (b) "Systematic errors change the variance but not the mean" - do you agree with the statement? Explain your answer.

   (c) Once you have defined an effective metrics program for your organization, how frequently should you change it?.

   (d) Define the pros and cons for "Function Point".

   (e) Why measuring metrics are a function of time?

   (f) Show that the mean can be used as a measure of central tendency for interval-scale data.

3. Answer the following Questions (Any TWO). $2 \times 5 = 10$

   (a) Define a four-level model for software reliability using the metrics meta-model.

   (b) [i] Define the measurement scale types. (2)

   [ii] Suppose that the attribute "complexity" of software modules is ranked as a whole number between 1 and 5, where 1 means "trivial," 2 "simple," 3 "moderate," 4 "complex," and 5 "incomprehensible." What is the scale type for this definition of complexity? How do you know? With this measure, how could you meaningfully measure the average of a set of modules? (3)

   (c) You have a system that has 3 inputs, 1 output, and 1 database file. All are of average complexity. The Technical Complexity Factors are all 2. You are writing this in Java[The David Consulting Group's gearing factor for JAVA is 80]. Count UFPs, AFP, and expected LOC for this given data.

TABLE 4.3 Function Point Complexity Ratings

Component	Simple	Average	Complex
Inputs (I)	3	4	6
Outputs (O)	4	5	7
Data Files (F)	7	10	15
Interfaces (N)	5	7	10
Inquiries (Q)	3	4	6

Part B

4. Answer the following Questions (Any **Five**). $5 \times 1 = 5$
   (a) What are the types of software development complexity?
   (b) What is the "sweet spot"?
   (c) What is measured by the "Information flow metric"?
   (d) The Agresti–Card–Glass metric attempts to measure both coupling and cohesion - true or false.
   (e) True or False: Good software should be less than 2 defects per KLOC.
   (f) What is "Defect Removal Efficiency"?
   (g) True or False: If you have a module with a CC 50, you should seriously consider refactoring/rewriting it.

5. Answer the following Questions (Any **Four**). $2.5 \times 4 = 10$
   (a) According to the Maintainability Index, decreases in which improves code maintainability and Why?
   (b) Explain the relationship between defect density vs. module complexity.
   (c) Define "Defect Removal Efficiency" and give an example for this metric.
   (d) Define the CK metric suite.
   (e) Do you think "fanin seems to be a right choice for information flow complexity"? Why or Why Not?
   (f) What does High information complexity of a procedure indicates?

6. Answer the following Questions (Any **One**). $1 \times 10 = 10$
   (a) The following pseudocode implements the Sieve of Eratosthenes, which finds all prime numbers less than n.

```
Eratosthenes (n) {
    e[1]:= 0
    for i:= 2 to n do e[i]:= 1
    p:= 2
    while p*2<n do {
        j:= p*2
        while (j<n) do {
            e[j]:= 0
            j:= j+p
        }
        repeat p:= p+1 until e[p] = 1
        }
        j := 0
        for i:=2 to n do {
            if e[i]==1
                a[j++] = i
        }
        return(a)
    }
```

   Calculate the following complexity metrics for this program: LOC, CC, ECC, Halstead, Agresti-Card-Glass, information flow, and maintainability index. [NOTE: $MI = 171 - 5.2ln(aV) - 0.23aV(g') - 16.2ln(aLOC) + 50sin[(2.4 * perCM)^{1/2}]$]

   (b) You are now in system test. For "SWE TECHNOVENT WEBSITE", you have the defect arrival data points below till now. **Assume a Raleigh curve.**

Month	1	2	3	4	5	6
Defects Found	13	22	25	22	17	5

   [i] What will be the equation to predict defects ($f(t)$ & $F(t)$) for this system? (7)
   Reference: (a) $f(t) = K * 2(t/c^2)e^{-(t/c)^2}$ and (b) $F(t) = K(1 - e^{-(t/c)^2})$

   [ii] If you shipped at the end of month 3 (and assuming you removed all the defects found at that time), what would you predict as the defect removal efficiency? (3)

100/6 50/3