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SE Test

Q.1): What are various categories of Software Metrics? With example.

A→

Software Metrics is measure of software characteristics which are measurable or countable.

(1) Product Metrics: measures characteristics of software products like size, complexity & quality.
eg: Lines of Code (LOC), Customer Retention Rate.

(2) Process Metrics: Track the efficiency and effectiveness of development processes.

eg: Defect Density → it is no. of defects per KLOC
development cycle timeouts, team velocity
no story points / sprint & bug fix response time = 48hr

(3) Project Metrics: Focus on project management such as cost and time estimation.

eg: velocity, ~~Defect Density~~, Burn Rate, Effort Schedule Variance.

Q.2) For each program with no. of unique operators & no. of unique operands, compute:

(i) Program Volume (3) Program Length
(2) Effort & Time (4) Program Level.

Solution n_1 = no. of unique operators
n_2 = no. of unique operands.

N_1 = total occurences of operators
N_2 = total occurences of operands.

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(i) Program Volume:

$$V = (N_1 + N_2) \times \log(n_1 + n_2)$$

(ii) effort (E) & Time (T)

$E = V/L$ L is program level

$E = V \times D = V \times \frac{n_1}{2} \times \frac{N_2}{n_2}$ D is difficulty lev.

Time $T = \frac{E}{18}$

(iii) Program length $N = N_1 + N_2$

(iv) Program Level (L)

$$L = \frac{2 \times n_2}{n_1 \times N_2} \qquad \boxed{L = \frac{1}{D}}$$

Q.3) What is software testing? Discuss the role of software testing during software cycle? Why it is so difficult?

A>

Software Testing is the process of evaluating & verifying a software application to ensure it meets specified requirements and defect free.

Test identifies bugs, functionality, & ensures quality standards.

It plays a crucial role during SDLC because by identifying errors early ensuring quality & validating functionality before release.

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Role of Software Testing in SDLC:

① Requirement Analysis Phase: tests if requirements are testable.
② Design Phase: Create plans based on design document
③ Development phase: Unit testing, integeration testing
④ Testing Phase: System testing, acceptance testing
⑤ Maintenance: Confirms software meets business requirements, ready for deployment

Challenges of Software Testing

① Complexity: Modern systems have complex functionality making testing difficult. Infinite test paths may be possible

② Changing Requirements:
Requirements can evolve during project lifecycle making it hard to update.

③ Time Constraints:
Testing within tight deadlines can limit thorough testing especially for complex software

Q.4) What is cyclomatic complexity? Explain with help of example.

A→ Cyclomatic Complexity is a software metric that measures the complexity of program. by counting the number of linearly independent paths through the code. This is used to estimate the number of test cases required for full path coverage:

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Cyclomatic Complexity $= E - N + 2P$

$E \rightarrow$ no. of edges $N \rightarrow$ no. of nodes
$P \rightarrow$ no. of connected components

Example
For flow graph with 4 nodes & 5 edges.

$$E = 5 - 4 + 2(1) = 3$$

A high cyclomatic complexity indicates more testing is needed. as code is more intricate