

SECTION A

Answer ALL questions

1. Briefly define the term 'Software Engineering' and provide three reasons for Software Engineering. (max. 80 words) (6 marks)

2. While there are three ways to determine cyclomatic complexity, of which two ways involve a calculation. For the flowgraph in Appendix 1, you must show, step by step, how you have calculated the cyclomatic complexity, using one of the two ways. (8 marks)

3. As the IT manager you have four options for your new software package; build new, reuse and modify, buy off-the-shelf and modify, outsource.
 - If you build, there is a 70% probability of complex/difficult development, at a cost of £450,000, and only a 30% probability of straightforward development, at a cost of £380,000.
 - If you reuse, there is a 40% probability of a minor number of modifications, at a cost of £275,000. If there are a major number of modifications (60% probability), at a likely cost of £380,000.
 - If you buy off-the-shelf, in addition to the initial cost of £240,000, there is 50% probability of minor changes, taking the cost to £320,000, and a 50% probability of major changes, taking the cost to £400,000.
 - If you outsource, you have been quoted a fixed price of £350,000 from a reliable company.

Which option do you choose? (6 marks)

Discuss the factors might make you select the nearest option instead? (5 marks)

SECTION B*Answer THREE questions*

4. Define software reliability and, (6 marks)
compare and contrast the Basic and Logarithmic Poisson software failure models, giving the underlying assumptions that apply to both, and to each separately. (13 marks)

Using the Log Poisson model, if the initial failure rate is 10, 40 faults have been found, and the failure decay rate is 0.025, what is the current failure rate? (6 marks)

The formula for the Logarithmic Poisson model is:

$$\lambda(\mu) = \lambda \exp^{-\theta\mu}$$

5. What are the main clauses of the standard ISO 9000-3 (Guidelines on the Application of QMSs to Software)? (6 marks)

Briefly describe the stages of the quality management certification process. (10 marks)

Evaluate the role of a software quality auditor by citing, (i) the three types of audit they may be called upon to perform, and (ii) the basic principles of a QM system they are seeking to verify through the audit. (9 marks)

6. Briefly define both black box and white box testing and give a test method for each. (6 marks)

The objectives of testing, as stated by Myers,

- *executing a program with the intent of finding errors*
- *a good test case has a high probability of finding an as-yet undiscovered error*
- *a successful test is one that uncovers an as-yet undiscovered error.*

were a major change of viewpoint when they were first presented; state the objectives and briefly explain why they represented a major change. (10 marks)

Write out the independent test paths through the flowgraph in Appendix 1. Each incorrect path will have half a mark deducted. (5 marks)

Would exhaustive testing, even if possible, guarantee a program was 100 percent correct, and why? (4 marks)

7. Your project manager has become concerned about the lack of a proper measurement programme in the project, she has now asked you to critically review two specific areas of software measurement.

Firstly, historically, many software measurement programmes have failed. One US survey put the failure rate is high as 80%. Discuss the reasons for so many failures

(10 marks)

Secondly, review the Goal Question Metric paradigm.

(15 marks)

8. Name and briefly describe the five levels of the CMM. (10 marks)

Evaluate the points for and against the SEI's description of each level of the Capability Maturity Model (CMM) as a 'well-defined plateau on the path towards becoming a mature software organisation'. (8 marks)

As a small, specialist, European software developer would you reject or adopt the CMM, and why? (7 marks)

Appendix 1

