

SECTION A

Answer ALL questions

1. As the IT manager you have four options for your new software package; build, reuse and modify, buy off-the-shelf & modify, and outsource.
- If you **build**, there is a 70% probability of complex/difficult development, at a cost of £500,000, and only a 30% probability of straightforward development, at a cost of £400,000.
 - If you **reuse**, there is a 50% probability of minor modifications, at a cost of £320,000. If there are major modifications (50% probability), there is also an 80% probability that the major modifications will be complex, at a likely cost of £450,000, and a 20% probability that the major modifications will be simple, at a cost of £300,000.
 - If you **buy** off-the-shelf, there is 50% probability of minor changes, giving a cost of £360,000, and a 50% probability of major changes, giving a cost of £400,000.
 - If you **outsource**, you have been quoted a fixed price of £340,000 from a reliable company.

Which option do you choose, and why?

- 6 marks

Discuss the factors might make you select the nearest option instead?

5 marks

Note: Remember to clearly show any calculations and any factors considered.

2. Using the tables and formula provided in Appendix 1 compute the Function Point count for a project with the following information domain characteristics:
- | | |
|----------------------------|----|
| No. of user inputs | 25 |
| No. of user outputs | 20 |
| No. of user enquiries | 15 |
| No. of files | 5 |
| No. of external interfaces | 3 |

This is an average project; assume that all weighting factors are average, and each technical complexity factor is rated as average. Remember to clearly show your calculations.

- 8 marks

3. Briefly discuss the purpose of Boehm's COCOMO model, and outline the limitations inherent within it.

- 8 marks

4. Define software quality and distinguish between software quality assurance and software quality control

- 8 marks

5. Configuration Management attempts to manage and control the change that inevitably happens to software components – referred to as software configuration items (SCIs). Briefly outline the process by which change to SCIs is managed and controlled. - 6 marks
6. Evaluate the role of a software quality auditor by citing, first, the three types of audit they may be called upon to perform, and second, the basic principles of a quality management system that they are seeking to verify through the audit. - 9 marks
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SECTION B

Answer TWO questions only

7. a) Define software reliability; - 3 marks
- b) can a program be correct and still not be reliable or safe? - 3 marks
- c) When modelling the failure process, people talk about fault, error and failure – distinguish between fault, error and failure (if you wish, you may use a diagram to help you explain). - 9 marks
- d) Give two ways in which failures are measured against time. - 4 marks
- e) Using the Log Poisson model, if the initial failure rate, λ_0 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:

$$\lambda_{\mu} = \lambda_0 e^{(-\theta\mu)}$$

8. a) Name and briefly describe the 5 levels of the Capability Maturity Model (CMM). -5 marks
- b) Briefly discuss the points for and against the SEI's description of each level of the CMM as a 'well-defined plateau on the path towards becoming a mature software organisation'. - 8 marks
- c) Explain how a maturity level of the CMM is structured (you may use a diagram if it helps) - 8 marks
- d) As a small, specialist, European software developer would you reject or adopt the CMM, and why? - 4 marks

9. Your project manager has become concerned about the ethical and legal aspects of the project you are both involved in; she has asked you to critically review them.
- a) Firstly, distinguish between an ethical and a legal issue.
- 4 marks
 - b) Secondly, define 'Personal Data'
- 3 marks
 - c) Identify the eight enforceable principles, identified by the Data Protection Act, for processing personal data.
- 8 marks
 - d) Briefly identify and review each of the five steps you would follow in an Ethical Analysis of a situation.
- 10 marks
10. a) Define Software Measurement.
5 marks
- b) There are four different approaches to estimation; identify and review each approach.
- 8 marks
 - c) Which is the least important of the following three attributes of measurement; repeatability of the measurement, minimal measuring error, an objective measure
- 2 marks
 - d) What are the reasons for the slow adoption of measurement?
- 10 marks

Appendix 1

information domain characteristic	count	x	weighting factor			=	
			simple	average	complex		
No. of user inputs		x	3	4	6	=	
No. of user outputs		x	4	5	7	=	
No. of user enquiries		x	3	4	6	=	
No. of files		x	7	10	15	=	
No. of external interfaces		x	5	7	10	=	
count total =							

$$FP = \text{count total} \times (0.65 + 0.01 \times (TCF))$$

Where TCF = the sum of the technical complexity factor rates:

E_i

1. Does system require reliable backup and recovery,
2. Are data communications required,
3. Are there distributed processing function,
4. Is performance critical,
5. Is system to run in an existing, heavily used environment,
6. Does system require on-line data entry,
7. Does on-line data entry require the transaction to be built over multiple screens or operations,
8. Are master files updated on-line,
9. Are the inputs, outputs, files, or enquiries complex,
10. Is the internal processing complex,
11. Is the code designed to be reusable,
12. Are conversion and installation ease included in the design,
13. Is system for multiple installations in different organisations,
14. Is system design to facilitate change and ease of use.

Rate each of the technical complexity factor as a value from 0 to 5, from the following scale

0 _____ 1 _____ 2 _____ 3 _____ 4 _____ 5
 No influence Insignificant Moderate Average Significant Essential