

# Software Quality Engineering

3 Hours Duration

Notes:

1. If doubt exists as to the interpretation of a question, the candidate is urged to submit with the answer paper a clear statement of any assumptions made.
2. No calculator is permitted. This is a **closed book** examination.
3. Answer any **five of the seven** questions.
4. Only the **first five questions** as they appear in your answer book will be marked.
5. All questions have equal weight.

**Question #1.** *Requirements gathering techniques*

Clearly explain any three of the following four steps in a requirements gathering process.

- i. Requirements elicitation
- ii. Requirements analysis and negotiation
- iii. Requirements specification
- iv. Requirements validation

**Question #2.** *Formal approaches to specification of requirements*

Read the following description of a library information system and represent it using entity-relationship diagram(s).

*A library contains hundreds of books. A book is written by one or more authors. Someone may be an author or coauthor of several books. A member of a library can borrow one or more books. The same book cannot be borrowed by more than one member at the same time.*

**Question #3.** *Formal specification languages*

Clearly explain the following requirements description techniques in terms of what aspects of requirements can be specified by using those techniques.

- i. Data flow diagrams
- ii. Entity-relationship diagrams
- iii. State transition diagrams

**Question #4.** *Handling changing requirements*

- i. Clearly explain the idea of requirements management.
- ii. Clearly explain three important activities that characterize requirements management.
- iii. Clearly explain three different types of traceability information to be maintained for managing requirements.

**Question #5.** *Certification, verification and validation techniques*

Clearly explain the five levels of the Capability Maturity Model (CMM) certification process.

**Question #6.** *Advanced testing techniques*

- i. Clearly explain the advantages and limitations of unit testing.
- ii. Clearly explain any five of the following seven categories of system testing.
  - a. Functionality tests
  - b. Robustness tests
  - c. Inter-operability tests
  - d. Scalability tests
  - e. Documentation tests
  - f. Conformance to regulatory bodies tests
  - g. Performance tests

**Question #7.** *Statistical software reliability*

- i. Define software *reliability* metrics in two ways.
- ii. Suggest an appropriate reliability metric from the above two definitions for the following classes of software systems.
  - a. A library information system
  - b. A software system for air traffic control
  - c. The control software running on a space module for exploration of Mars
  - d. A word processor
  - e. An embedded software system running on a cellular phone