

SOFTWARE ENGINEERING
(MCAP 2201)

Time Allotted: 2½ hrs

Full Marks: 60

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
any 4 (four) from Group B to E, taking one from each group.*

Candidates are required to give answer in their own words as far as practicable.

Group – A

1. Answer any twelve:

12 × 1 = 12

Choose the correct alternative for the following

- (i) What is the primary focus of software engineering ethics?
 - (a) Maximizing profits for software companies
 - (b) Prioritizing technical excellence over user needs
 - (c) Ensuring the safety and well-being of society
 - (d) Exploiting vulnerabilities in software systems.
- (ii) Which term refers to the integration of social and technical aspects in a complex system?
 - (a) Socio-technical system
 - (b) System engineering
 - (c) System procurement
 - (d) System development.
- (iii) Which software process model involves a sequential flow of activities from requirements gathering to deployment?
 - (a) Agile model
 - (b) Waterfall model
 - (c) Incremental model
 - (d) RAD model.
- (iv) What does the V-shaped model emphasize in software development?
 - (a) Documentation
 - (b) Verification and validation
 - (c) Documentation
 - (d) User involvement.
- (v) Non-functional requirements are also known as
 - (a) System requirements
 - (b) Quality requirements
 - (c) Business requirements
 - (d) User requirements.
- (vi) What document captures all requirements of a software system?
 - (a) System design document
 - (b) Software requirements specification (SRS)
 - (c) Test plan document
 - (d) Project management plan.

- (vii) Which process involves managing changes to requirements throughout the software development lifecycle?
 (a) Requirements elicitation (b) Requirements specification
 (c) Requirements management (d) Requirements validation.
- (viii) Context models in system modelling depict
 (a) interactions between system components
 (b) system boundaries and interactions with external entities
 (c) the internal structure of the system
 (d) the behaviour of the system over time.
- (ix) Which system modelling technique is commonly used to represent the flow of control and data within a system?
 (a) Data flow diagrams (DFDs) (b) Use case diagrams
 (c) Sequence diagrams (d) Entity-relationship diagrams (ERDs).
- (x) What is the primary focus of architectural design in software development?
 (a) Implementing individual features
 (b) Defining the overall structure of the software system
 (c) Writing code for specific functionalities
 (d) Testing the software for bugs.

Fill in the blanks with the correct word

- (xi) _____ and _____ distinguishes agile methods from plan-driven approaches in software development.
- (xii) Basis path testing aims to achieve ____ coverage of the program.
- (xiii) Alpha testing is conducted by ____, whereas beta testing involves actual end-users.
- (xiv) Software re-engineering involves ____ the software to enhance its quality or performance.
- (xv) McCall's Quality Factors include ____, maintainability, and portability.

Group - B

2. (a) Analyze the various software application domains and discuss the challenges specific to each domain. [[C01](Analyse/IOCQ)]
 (b) Evaluate the importance of umbrella activities in software development process. Provide examples to illustrate their significance. [[C01](Analyse/IOCQ)]
(3 + 4) + 5 = 12
3. (a) Critically assess the impact of customer myths on software project success, citing relevant examples from industry. [[C01](Analyse/IOCQ)]
 (b) Evaluate the advantages and limitations of the Incremental Process Model in software development. [[C02](Analyse/IOCQ)]
6 + (3 + 3) = 12

Group - C

4. (a) Explain the difference between functional and non-functional requirements in software engineering. Provide examples to illustrate each type. [[C02](Understand/LOCQ)]
- (b) Critically analyze the methods used for requirements elicitation and analysis. Discuss their effectiveness in capturing stakeholders' needs and requirements. [[C02](Analyse/IOCQ)]
- (4 + 2) + 6 = 12**
5. (a) Design a use case diagram for a university registration system. The system should allow students to register for courses, view their schedules, and update personal information. Faculty members should be able to manage course offerings, assign grades, and access student information. Administrators should have privileges to add new courses, enrol students, and generate reports. The system should also support interactions with external entities such as the registrar's office for transcript requests and the financial aid office for scholarship applications. Ensure that the use case diagram accurately represents the various actors and their interactions. [[C03](Apply/IOCQ)]
- (b) Consider a database application project with the following characteristics:
- I. The application has 6 screens with 5 views each.
 - II. There are 9 database tables for 4 servers and 5 clients.
 - III. The application may generate three reports, each with 7 sections, from 9 database tables for 3 servers and 4 clients.
 - IV. There is a 15% reuse of object points.
 - V. The developer's experience and capability in a similar environment are low.(4)
 - VI. The maturity of the organization in terms of capability is also low (4).
- Complexity weights for screen (1, 2, 3), report (2, 5, 8).
Calculate the object point count, new object points, and effort required to develop such a project. [[C03](Apply/IOCQ)]
- 7 + (2 + 2 + 1) = 12**

Group - D

6. (a) Explain the concept of architectural views in software design. Compare and contrast different types of architectural views. [[C04](Understand/LOCQ)]
- (b) Describe the concept of application architectures. Compare and contrast monolithic, client-server, and microservices architectures. [[C04](Remember/LOCQ)]
- (2 + 4) + (2 + 4) = 12**
7. Explain the Scrum framework in detail, including its roles, events, artifacts, and underlying principles. Discuss how Scrum facilitates iterative and incremental software development and promotes collaboration within cross-functional teams. [[C03](Analyse/IOCQ)]
- (6 + 6) = 12**

Group - E

8. (a) Discuss the concepts of error, fault, bug, and failure in software testing. Provide a detailed explanation of each term and describe how they are interconnected in the software development lifecycle. Illustrate your answer with real-world examples of software failures attributed to specific errors or faults. [[CO4](Analyse/IOCQ)]
- (b) Explain the role of control flow graphs (CFGs) in basis path testing. How are CFGs constructed and utilized during the testing process? [[CO4](Understand/LOCQ)]
- (4 + 4) + 4 = 12**
9. (a) A credit card company have a different cash back policy depending on the purchase by the customer. In order to test the software that calculates the cash back percentage, we can identify the ranges of balance values that earn the different cash back %.
- I. If shopping in the range of Rs. 0 up to Rs 10000 has a 10% cash back,
II. If shopping over Rs. 10000 and up to Rs 50000 has a 20 % cash back,
III. If shopping of Rs. 50000 and over have a 30% cash back.
- Construct a decision table and design test cases for the above scenario. [[CO4](Apply/IOCQ)]
- (b) Define software re-engineering and articulate circumstances necessitating its implementation in the software development lifecycle. [[CO5](Understand/LOCQ)]
- (4 + 4) + (2 + 2) = 12**
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Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	27	73	0

Course Outcome (CO):

After the completion of the course students will be able to

- MCAP2201.1 Exemplify the software engineering process, systems and security
- MCAP2201.2 Explain software engineering process by identifying the requirements and system modelling.
- MCAP2201.3 Design, develop and implement software based on requirement.
- MCAP2201.4 Illustrate the evolution process, reuse and testing for developing a quality software for customer.
- MCAP2201.5 Describe the software management, project management, and planning and configuration management

*LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question.