



**Course Title: Software Engineering and Information System Design**

Department of Computer Science and Telecommunication Engineering

Year 3, Term 2, Final Examination (May 2025), Session 2020-21

Course Code: CSTE 3209, Full Marks: 70, Time: Four hours

Answer any **SEVEN** of the following questions.

- 1.a) Define *Software Engineering*. How does it differ from traditional programming? 3
- b) List the main phases of the *Software Development Life Cycle (SDLC)*. Explain why iteration may be necessary. 4
- c) Mention two major challenges software engineers face during the lifecycle. 3
  
- 2 a) What is a task set? List the task sets for requirement gathering action for a big project. 2+2
- b) Discuss different types of process flow with proper diagrams. 4
- c) What are the approaches to process improvement? Explain shortly. 2
  
- 3.a) What is process pattern? Explain about the different types of process patterns with examples. 1+3
- b) Discuss briefly the steps of personal software process (PSP). 3
- c) What is a waterfall model? List the circumstances where the use of the model is most suited. 3
  
- 4.a) Explain the roles of the following team members: *Project Manager*, *System Analyst*, and *Tester*. 4
- b) What is Agile methodology? How is it different from Waterfall? 4
- c) What is a Version Control System? Why is it critical in collaborative software development? 2
  
- 5.a) What is requirement engineering? Discuss the steps involved in requirement engineering. 1+4
- b) Draw a context diagram (Level 0) and Level 1 DFD for the following ***Hotel booking system***: 2+3  
 This system will be used by customers who want to book a hotel room in advance. Customers can search for rooms, types, prices, and availability from the Room file. To search, customers must provide check-in and check-out dates. Based on the dates provided, the system checks for the availability of rooms and its specifications. Then, the system provides room status notification to the Customer. If a room is available, the customer can book the room by making online payment (via debit or credit card) and it will be stored in the Booking file. If payment is successful, system will generate the payment receipt and booking confirmation number will be given to the Customer. Customer can print the payment and confirmation details.
  
- 6.a) What is a data dictionary? Differentiate between active and passive data dictionary. 1+2
- b) What are the FURPS quality attributes? Explain shortly. 3
- c) Construct a use case diagram for the following ***Patient Record and Scheduling System***: 4  
 A patient record and scheduling system in a doctor's office is used by receptionists, nurses, and doctors. The receptionists use the system to enter new patient information when first-time patients visit the doctor. They also schedule all appointments. The nurses use the system to keep track of the results of each visit including diagnosis and medications. For each visit, free form text fields are used to capture information on diagnosis and treatment. Multiple medications may be prescribed during each visit. The nurses can also access the information to print out a history of patient visits. The doctors primarily use the system to view patient history. The doctors may enter some patient treatment information and prescriptions occasionally, but most frequently they let the nurses enter this information. Each patient is assigned to a family. The head of family is responsible for the person with the primary medical coverage. Information about doctors is maintained since a family has a primary care physician, but different doctors may be the ones seeing the patient during the visit.

- 7.a) What are the steps of software project estimation? Explain briefly with a proper diagram. 4  
 b) Why high cohesion and low coupling generate good software design? Explain with an example. 3  
 c) Determine the completion time of the following project using critical path method: 3

Activity duration	Description	Predecessors	Estimated
A	Contract signing	None	5
B	Questionnaire design	A	5
C	Target market ID	A	6
D	Survey sample	B, C	13
E	Develop presentation	B	6
F	Analyze results	D	4
G	Demographic analysis	C	9
H	Presentation to client	E, F, G	2

- 8.a) Describe how to identify potential classes for class model in software engineering. 3  
 b) Contrast between LOC and FP with proper examples. 3  
 c) What do you mean by COCOMO model? For a given Semidetached project was estimated with a size of 300 KLOC. Calculate the Effort, Scheduled time for development by considering developer having very high application experience and very low experience in programming. 1+3

Project Type	a	b	c	d
Organic	2.4	1.05	2.5	0.38
Semidetached	3	1.12	2.5	0.35
Embedded	3.6	1.2	2.5	0.32

Cost Drivers Parameters	Very Low	Low	Normal	High	Very High
Personnel Parameter					
Analysis capability	1.46	1.19	1	0.86	0.71
Application Experience	1.29	1.13		0.91	0.82
Software Engineer Capability	1.42	1.17		0.86	0.7
Virtual Machine Experience	1.21	1.10		0.9	NA
Programming Experience	1.11	1.07		0.95	NA

- 9.a) What are the ethical responsibilities of a software engineer when developing public service applications (e.g., COVID tracking app)? 4  
 b) Define *intellectual property* in the context of software. Give two ways to protect it. 3  
 c) Mention two real-life cases where software failure led to major social or economic consequences. 3