National University of Computer and Emerging Sciences, Lahore Campus

	Course Name:	Software Engineering	Course Code:	CS 3009
	Degree Program:	BS (CS)	Semester:	Spring 2023
	Exam Duration:	60 Minutes	Total Marks:	45
	Paper Date:	25-Feb-2023	Weight	15%
	Section:	ALL	Page(s):	5
	Exam Type:	Midterm-I		

Student : Name:_____Solution_____ Roll No._____ Section:_____

Instruction/Notes:
1. Attempt all questions on the question paper. Do not submit any extra sheet, it will not be graded.
2. You are allowed to use a single-sided, hand-written, A-4 size help sheet. Photocopies are not allowed.
3. State your assumptions clearly

Question 1 (Marks = 10)

In each of the following MCQs, **circle** the most appropriate **single** option. Unclear answers will not be given any credit.

1) The incremental software development process is:

a. a reasonable approach when the product is small in size and has only one module.
b. a good approach when a working core product is required quickly.
c. the same as the non-incremental software development process.
d. a revolutionary approach that is not used for commercial products.
e. a reasonable approach when requirements are vague.

2) In software engineering process, the framework activity named 'Construction' mainly consists of

a. Analysis and synthesis
b. Comprehension and expression
c. Code generation and testing
d. Modelling and deployment
e. Tracking and control

3) Pick the odd one out:

a. Software quality assurance
b. Communication
c. Modeling
d. Planning
e. Deployment

4) The software systems that have inextensible designs, convoluted code, poor or nonexistent documentation, and poorly managed change history but are difficult to abandon because they are indispensable to business are knows as

a. Embedded systems
b. Legacy systems
c. Open source systems

d. Engineering systems

5) Errors introduced in which of the following software lifecycle phases are most costly to fix if discovered after release of the software?

a. Requirements gathering
b. Design
c. Coding
d. Unit testing
e. Integration testing

6) Software Engineering is best described as:

a. the practice of designing, building, and maintaining off-the-shelf software from prefabricated parts.
b. the practice of designing, building, and maintaining software without the use of formal methods.
c. the practice of designing, building, and maintaining high-quality software in a timely and cost-effective manner.
d. the practice of designing, building, and maintaining fast and flexible software specifically for Engineering applications.
e. the practice of designing, building, and maintaining flashy, cheap, and buggy software engineered to generate large sales initially and an on-going market for updates.

7) Which of the following is most closely related with scrum?

a. Use cases
b. Stories
c. Scenarios
d. Sprints
e. Bad smells

8) Which software engineering activity simplifies the design of a component without changing its function or behavior?

a. User interface design
b. Requirements analysis
c. Refactoring
d. High level design
e. Low level design

9) Which of the following explicitly focuses on risk identification?

a. Waterfall Model
b. Incremental Model
c. Agile Methods
d. Spiral Model

10) In Extreme Programming, CRC stands for?

a. Class Responsibility Card.
b. Class Responsibility Collaborator.
c. Continuous Responsibility Collaborator.
d. Common Responsibility Collaborator.

Question 2 (Marks = 10)

Label each of the following requirements as Functional (F) or Non-functional (NF) in appropriate cell against each requirement.

Requirements	F / NF
1. The system shall show the users their existing bookings.	F
2. The system shall be available at all times, with as little downtime as possible for maintenance or updates.	NF
3. The system shall be able to manage 1000 requests at a time.	NF
4. The system shall display available flights, together with information such as departure and arrival timings, layover duration, and ticket price.	F
5. The systems shall provide flight status updates, including delays and cancellations.	F
6. The system shall protect sensitive client data and maintain the security of all transactions.	NF
7. The system shall provide a booking confirmation with a reservation number and itinerary within an hour of booking.	NF
8. Each request to the system shall be processed within 5 seconds.	NF
9. The system shall backup the data every few days.	NF
10. The system shall allow the managers to modify reservation rules.	F

Question 3 (Marks = 5)

Label each of the following requirements as Testable (T) or Not-Testable (NT). If a requirement is NT, rewrite it to make it testable.

The system shall show the error message in red color. T / NT

The system shall always correctly identify the 90% people in the input image. T / NT

The system shall correctly identify the 90% people in the input image 95% of the times.

The system shall have 0% down time. T / NT

The system shall have 0% down time during the working hours (9 AM to 5 PM) in the 5 working days of a week.

The system shall have a response time of 10 milliseconds with maximum 5000 simultaneously connected users. T / NT

The system shall use the hardware economically to save the memory. T / NT

The system shall not use more than 0.5 GB RAM during its execution.

Question 4 (Marks = 5+5 = 10)

List the process model that you think will be most appropriate for the following situations. Also, list your reason(s) for choosing a particular model. If you just list the process model without mentioning the reason(s), you will not be awarded any marks.

a. A client asked a software house to develop an application which enables its users to schedule the day, manage daily tasks, to-do list etc. Though client is not pretty sure about the exact look and feel of the software product but he is very conscious about the product's graphics and interface. The client is ready to provide feedback on the work done and can provide this feedback once or twice a week.

   Process Model:_____Prototyping_____

   Reason (s):

   - Client is not clear about exact requirements related to UI
   - Client can provide feedback and review the work
   - Agile cannot be used since the client cannot be available continuously throughout a week

b. Police department of Punjab is looking for a system based on Artificial intelligence techniques to control the traffic signals. It shall auto detect the direction from which an ambulance is coming and set that specific signal to green and facilitate the continuous movement of ambulance. To get the credit quickly, the government wants the system developed in the next 3, 4 months. The government is ready to spend money on project development including hiring of human resources for 4 months. A software company ABC took the project and started working on it. The initial work shows that the resultant system shall have 7 subsystems and development work on the subsystems can be started from very beginning without affecting the development of the other subsystems.

   Process Model:_____RAD_____

   Reason (s):
   - The 7 subsystems can be developed in parallel
   - The complete system is required within 90 to 120 days (3 to 4 months)
   - Human resources can be arranged as the government is ready to pay against their employment for 4 months
   - Requirements are pretty much known and an initial analysis has already divided the system functionalities into modules

Question 5 (Marks = 2x5=10)

GolfLabs is a dynamic company which allows golf coaches to analyze golf swings of players and advise the players based on the analysis. The coaches have mature rules for swing analysis and the rules need to be embedded in the software functionality. GolfLabs needs a software system that supports the coaches during analysis by processing players' videos. The processing will involve analysis based on the existing rules. The analysis should be automated and the system is expected to generate a report which will be reviewed by the coaches. The coaches approve or disapprove a report after the review and approved reports can be seen by the players using the same system. The disapproved reports are regenerated and presented for review. The main challenge is to perform the video analysis efficiently so that the coaches get the reports for review within 6 hours of high definition recording. Dealing with low accuracy of the analysis is another challenge; when the swing trajectory projection accuracy is below 80% the coaches get overburdened because it becomes mandatory for them to annotate the reports in such cases.

Based on the above description, list 3 functional and 2 non-functional requirements for the software system to be developed for GolfLabs. All requirements should be written in standard format with hierarchical numbering. All requirements should be testable.

Functional Requirements:

1. The system shall generate a swing analysis report (SAR) after processing the submitted video.

1.1. The system shall use the swing analysis rules to generate the SAR

1.2. The system shall allow the coaches to enter the analysis rules to the system

2. The system shall present the SAR to the coaches for review
3. The system shall allow the coaches to annotate the SARs
4. The system shall allow the coaches to review and approve/disapprove SARs
5. The system shall allow the players to view the approved SARs

Non Functional Requirements:

6. The system shall complete the swing analysis and generate the report within 6 hours of HD recording
7. The system shall have minimum 80% swing projection accuracy in more than 90% of the cases