National University of Computer and Emerging Sciences

Software Engineering (CS3009)

Date: February 28th 2024

Course Instructor(s)

Ms. Ansa Liaqat
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Sessional-I Exam

Total Time: 1 Hours
Total Marks: 45
Total Questions: **02**

Semester: SP-2024
Campus: Lahore
Dept: Computer Science

_____	_____	_____	_____
Student Name	Roll No	Section	Student Signature

_Dr. Zeeshan Rana_____ _____

Vetted by Vetter Signature

Instructions/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 one-sided, hand-written, A-4 size help sheet. Photocopies are not allowed.
3. State your assumptions clearly
4. CLO stands for Course Learning Outcome
5. CLO statements are copied from the course outline and do not help in reaching a solution.

CLO #1: Select an appropriate software development process for a software project

Q1: Part a **[5+5=10 Marks]**

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.

i. Picasa Solutions is a large-scale software development company. One of their clients wants to get a WhatsApp like application developed for their business. The client wants to use this application to secure all business-related communication, and this app is intended to be used only for internal company communication. Client wants to get this application fully developed and ready to use in 2-3 months. Your company has sufficient amount of highly skilled professionals to build applications in the required time frame. Client's business spans over 3 countries including Pakistan, China and USA. So the app needs to provide secure communication between multiple business entities. Development budget for this project is also very high and agreed upon by the client and your company. Project needs to be built with a highly modular design so that the code might get reused for future projects.

Process Model: _____RAD_____
Reason(s):

2,3 months' time box, sufficient amount of skilled professionals available, very high development budget, modular design,

ii. BlueTech Innovations is a startup specializing in renewable energy solutions. 7 months ago, the start-up secured funding for developing a smart energy management platform that allows users to monitor and optimize their energy consumption. The platform under development aims to integrate with smart devices, such as thermostats, solar panels, and electric vehicle chargers, to provide users with real-time insights and control over their energy usage. The company had a vision of releasing a Minimum Viable Product (MVP) within 6 months to showcase to potential investors and early adopters. However, the project was poorly managed by the development team and after 7 months there is still no product ready for release. A Lot of work is in progress and a stable release cannot be rolled out to customers. Frequent changes and new requirements are constantly arising. BlueTech is frustrated with the situation and wants to adopt a process model that can help achieve the following:

a. Teams can adapt to changing requirements while maintaining a clear focus on the project vision.
b. Projects should deliver the most valuable features sooner, embrace change, and provide better project visibility

Process Model: _____Scrum_____
Reason(s):

Visibility, frequent customer interactions, prioritized features required earlier, incremental model did not help come up with MVP intime

Part b **[15 Marks]**

In each of the following MCQs, **circle** the most appropriate **single** option. Unclear answers will not be given any credit. In case of cutting and/or overwriting **marks cannot be contested**.

1. Which of the following process models divides a software project into four phases?
    a. Waterfall
    b. Spiral
    c. Unified process
    d. Prototyping
    e. Scrum
2. Which of the following prescribes to engineer software in iterations of four phases?
    a. Waterfall
    b. Spiral
    c. Unified process
    d. Prototyping
    e. Scrum
3. Rapid Application development (RAD) model is:
    a. Just another name of incremental model
    b. A quick adaptation of waterfall model
    c. Not suitable when a project can be well modularized
    d. Suitable when team members are not available
    e. None of the above
4. The primary objective of the umbrella activities in software engineering is to:
    a. Protect the software engineering process from potential costs
    b. Monitor the software engineering process
    c. Carry out the process as planned
    d. None of the above
5. Why is the Waterfall model considered unsuitable for changing requirements?
    a. It involves constant iterations
    b. It facilitates quick product development
    c. It assumes requirements can be frozen
    d. It is designed for agile project management
6. Which of the following accurately defines the concept of a Product Backlog in Agile methodology?
    a. A comprehensive archive of user stories and acceptance criteria.
    b. A dynamic document outlining the project's technical architecture.
    c. A prioritized inventory of project tasks scheduled for implementation.
    d. A prioritized list of project requirements or features delivering customer value
7. In scrum, the role of a Product Owner is to:
    a. Own the product
    b. Manage product backlog
    c. Manage Agile process
    d. Manage sprint backlog
8. How do the developers maintain the simplicity of code in XP?
    a. Through Test First Development (or Test Driven Development)
    b. Through Refactoring
    c. Both a & b
    d. Through Pair Programming

9. Which of the following is not a role in Scrum?
    a. Product Owner
    b. Development team
    c. Scrum Master
    d. Scrum Manager
10. Which of the following represents the "4 P's" of project management?
    a. Progress, Performance, Planning, Profitability
    b. People, Process, Product, Project
    c. Planning, Procurement, Progress, Performance
    d. Program, Portfolio, Project, Planning
11. Which of the following member of the software engineering team has no role in software maintenance?
    a. Requirements Analyst
    b. Designer
    c. Programmer
    d. Tester
    e. Trainer
    f. None of the above
12. Legacy systems:
    a. Are easy to change
    b. Are difficult to change
    c. Have convoluted control flow
    d. Are always preferred over non-legacy system
    e. b and c only
    f. None of the above
13. Unit cost to fix a defect in software
    a. Linearly increases as we enter in later phases of the software life cycle
    b. Exponentially grows as we enter in later phases of the software life cycle
    c. Stays constant as we enter in later phases of the software life cycle
    d. Decreases as we enter in later phases of the software life cycle
    e. None of the above
14. Failure curve for software and hardware follow:
    a. The bathtub curve
    b. The logarithmic curve
    c. The $y=1/x^2$ for +ve x curve
    d. a and b only
    e. None of the above
15. Which of the following is NOT a part of the framework activities of software process?
    a. Modeling
    b. Deployment
    c. Communication
    d. Debugging

Solution:

1.C 2.B 3.B 4.A 5.C 6.D 7.B 8.B 9.D 10.B 11. F 12.E 13.B 14.E 15.D

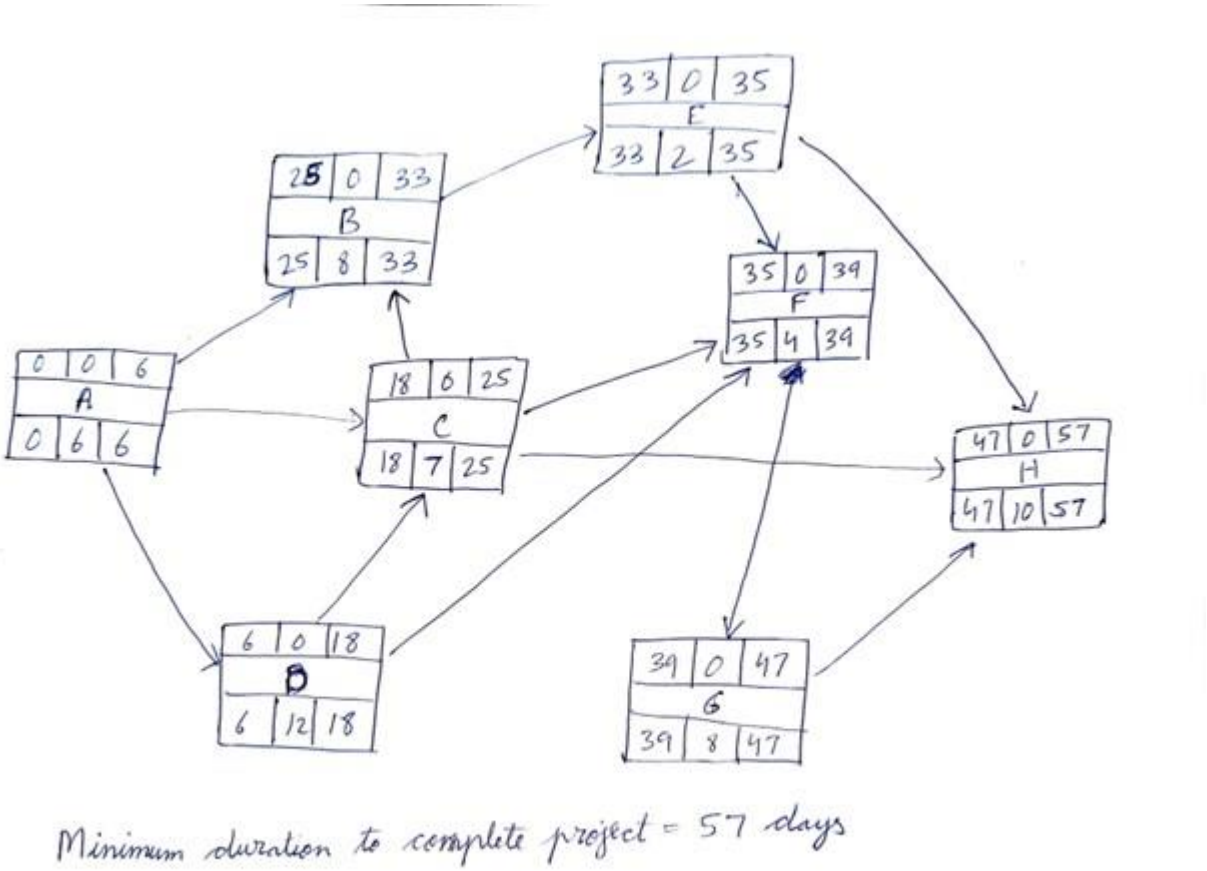
CLO #5: Construct reasonable sized software in team setting

Q2: Part a **[10 Marks]**

Draw an activity graph using the following table with tasks (or activities), the duration for each task and predecessor for each task.

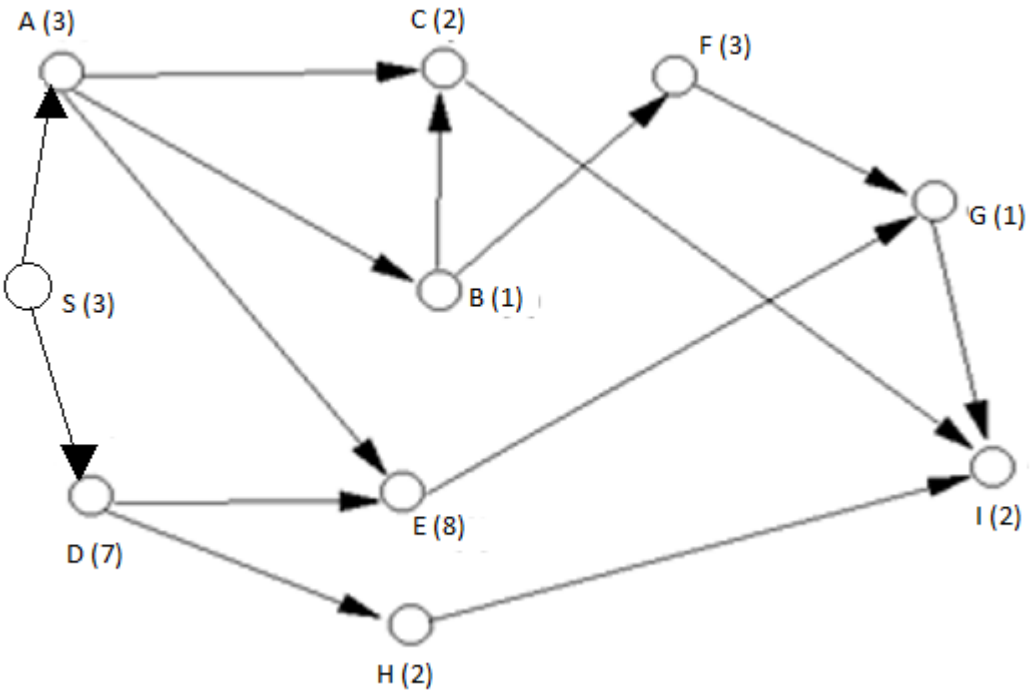
Activity/Task ID	Predecessor	Duration (Days)
A	-	6
B	A, C	8
C	A, D	7
D	A	12
E	B	2
F	C, D, E	4
G	F	8
H	C, E, G	10

To do:
Draw an activity graph (also known as activity on node graph) with correct labels and dependencies



Part b **[10 Marks]**

Consider the following activity graph where duration of each activity is mentioned in weeks (in brackets). Calculate and explicitly mention the minimum project completion time, slack on each activity, earliest and latest start time of each activity, earliest and latest finish time of each activity. Explicitly specify the critical activities and critical path. **Note:** You can redraw the graph using an appropriate node structure



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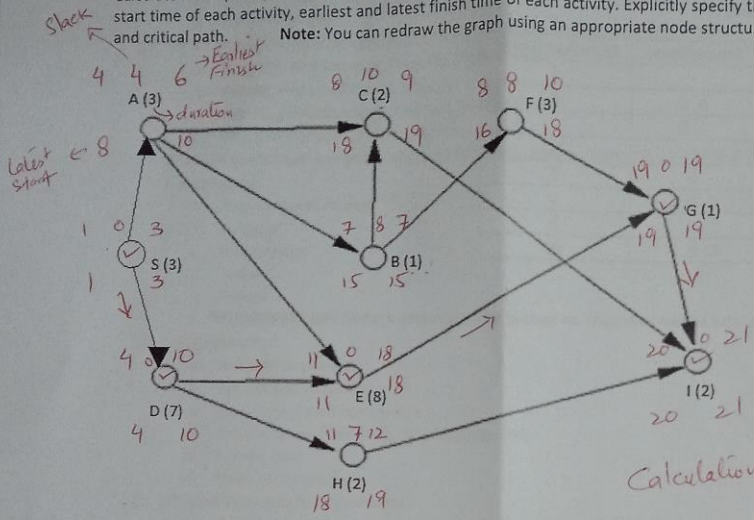
Part b **[10 Marks]**

Consider the following activity graph where duration of each activity is mentioned in weeks (in brackets). Calculate and explicitly mention the minimum project completion time, slack on each activity, earliest and latest start time of each activity, earliest and latest finish time of each activity. Explicitly specify the critical activities and critical path. **Note:** You can redraw the graph using an appropriate node structure



Calculations: 7 marks.

CP: S → D → E → G → I → 1 Mark (explicitly specified)

critical activities: S, D, E, G, I (marked with a ✓) → 1 Mark (explicitly ")

Min. duration: 21 weeks → 1 Mark (explicitly mentioned with units.

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