Name:

Roll No:

INDIAN INSTITUTE OF TECHNOLOGY TIRUPATI
CS302L SOFTWARE ENGINEERING
END EXAM (NOV 29 2023)

TIME: 180 Min
MARKS: 100

B.TECH
SEMESTER V

ANSWER ALL QUESTIONS

Firstly, read the entire question paper carefully and plan! Write your answer if the space is provided along with question. Be *agile*, *crisp*, *short* and *sharp* in your answers and *write* assumptions if any! Partial credit will be given based on Quality of the content, not Quantity. Your answers should be based on discussions in the course rather than *textbook-driven*! Also, write the questions in answer sheets as per question order as much as possible! →» Best ☺

Question: I never cheated in my exams or work →» True or False

A. Write True or False and write a one sentence rationale [justification] - 1 mark each, marks will be given only if justification is correct. (5 marks)

1. **T/F – Introduction of architecture design designs that do not violate prescriptive architecture is called as architecture decay.**

   False

2. **T/F - Regression is one of the techniques for validating requirements**

   True

3. **T/F – Uses cases are the main way to design the user interface layout and schematic of a web or mobile application**

   False

4. T/F – Including the users/customers in the process of coding will yield a

False

5. T/F – "Software should be written in C" is a valid functional requirement statement in Software Requirements Specification document

False

B. Multiple Choice Questions – Tick/round the correct answer or answers. 1 mark each, marks will be given only if justification is correct and if all correct answers are mentioned when there are multiple answers. (15X1= 15 marks)

6. The most important aspect of white-box testing is its ability to:

[a] Reveal the presence of defects in various parts of the code. obvious

[b] Establish the correctness of the module.

[c] Prove that every statement in the module is reachable. → Dead code elimin

[d] Prove that the module has a low cyclomatic complexity.

7. Which of the following is NOT an attribute of a well-written software requirements specification?

[a] Everything that the software is supposed to do is included in the specification.

[b] Every requirement stated therein has only one interpretation.

[c] Some of the requirements specify a target software architecture. Mostly non technical....

[d] All of the requirements are understandable by non-computer-specialist customers.

8. The elements of the software architecture of a software system include: I. Software Components II. Class diagrams III. Connectors expressing relationships between software components IV. Entity-relationship diagrams

[a] I and II
[b] I and III
[c] I, III, and IV
[d] I, II, III, and IV

9. The best approach for interchange of a large amount of structured data on the Web is to use:

[a] eXtensible Markup Language (XML)
[b] Hyperlink Markup Language (HTML)
[c] Component Object Model (COM)
[d] Java and Java-based technologies

10. Which of the following is NOT required of a software component?

[a] Must be a unit of independent deployment
[b] Must support reuse
[c] Must be encapsulated
[d] Must expose source code for modification

11. An engineer is tasked to verify a software release for a mission-critical system. The plan is for the release of software for verification to occur on a Monday, with verification complete the following Friday. The release turns out not to be available until Thursday. The best route for the engineer is to:

[a] Verify release criteria regardless of time line
[b] Do whatever testing can be done by Friday
[c] Volunteer to work over the weekend
[d] Relax release criteria

12. A design team is working on the design of a payroll system. The system is being revised to accommodate new features that the customer desires. Previous versions of the de-sign were not well documented, and the team is taking advantage of the current version to document new design.

During product implementation, a mixture of experienced and inexperienced developers were assigned to the project. The developers are not using consistent processes, and expectations have not been clearly defined. During code inspection, the lead developer told the inexperienced developers that their code was difficult to follow and understand. Inspecting their work would need to be rescheduled to give them an opportunity to improve their code. As far as this software organization is concerned, which is the MOST effective way to improve the understandability of their code?

[a] The developers need to improve the naming of variables and functions.
[b] The developers need to follow well-known industry coding standards in their work.
[c] The developers need to follow company coding standards in their work.
[d] The developers need to explain their work to their teammates so that they can better understand it.

although a and b should also be practiced
but the q asks for most effective...

13. Equivalence partitioning is
[a] A modular programming technique in which the application domain is subdivided into similarly sized functional areas
[b] A black box testing technique that divides the input domain of a program into classes of data from which test cases can be derived
[c] An object-oriented design technique for improving program structure by replacing inheritance with delegation
[d] A software project management technique for distributing test responsibility within a project

14. What does coupling NOT depend on?
[a] The references made from one component to another
[b] The closeness of the operations in the functions
[c] The degree of complexity in the interface between components
[d] The amount of control one component has over the other

menu screens whenever it is communicating with the user.

16. The following requirement was identified for the construction of a Software tool:

R3: The user will be able to move the different entities of a diagram in the screen grid. Initially, the grid will be off. A zoom option will be provided by the tools. The grid might be toggled between centimeters and inches.

What course of action should be taken to best facilitate requirement management and traceability?

[a] Restate the requirement to remove ambiguity in the language.
[b] Separate the requirement into a set of singular requirements.
[c] Consult the stakeholder to clarify the incomplete requirement statement.
[d] Consult the stakeholder to correct the accuracy of the requirement.

17. You are a requirements engineer working on a project to enhance a course registration and payment system for a large public university system. You are the requirements analyst. You are also a recent university graduate, so you have experience in the problem domain. Consequently, less time is allocated for understanding the problem domain.

Which of the following is the MOST LIKELY consequence of conducting the requirements specification phase under these conditions?

[a] Subtle mismatches between your conceptual understanding and the proper meaning of concepts within the domain are present, and will require rework.
[b] The time saved during the elicitation process is allocated to the requirement validation process, where more defects can be detected.
[c] Time is saved during the requirements specification process since you do not need to spend time asking follow-up questions to the stakeholders.
[d] Mismatches in your conceptual understanding and the proper meaning are less likely to occur. The quality of the requirement specification is maximized.

18. What type of relationship would exist between the classes Account and Customer if each Customer may own any number of Accounts (zero, one, or more) and each Account may be owned by any number of Customers?

[a] One-to-one
[b] One-to-many
[c] Many-to-many
[d] Zero-to-many

19. The software development organization SoftBank is going to develop a software system for a bank. The system will be used by bank cashiers to serve customer requests. The efficiency of the cashier using the software product is critical for the success of the project. The bank has a high turnover rate for bank cashiers. A hard requirement from the bank, based on standard industry practice, is that their cashiers should be able to enter 80% of the operations into the system in less than a minute for each client.

Which of the following approaches is the best to develop a software product that meets this usability requirement?

[a] Develop the internal part of the system first, and then give it to the human factors experts so they can provide the system with a highly usable user interface.
[b] Develop a highly efficient system in terms of internal data processing, and then provide the client with an intensive training program for the bank cashiers.
[c] Study the characteristics of the bank cashiers and the tasks they currently perform as a first step, and then perform iterative design on the system complemented with usability tests with real bank cashiers, until the usability goals are met.
[d] Clarify beforehand that this requirement is not feasible, and therefore SoftBank will decline to develop this product if the bank insists on including it as requirement.

20. Adaptive Maintenance is defined as:

[a] The modification of a software product after delivery to keep a computer program usable in a changed or changing environment
[b] The reactive modification of a software product performed after delivery to correct discovered faults
[c] The unscheduled corrective maintenance performed to keep a system operational
[d] The modification of a software product after delivery to improve performance or maintainability

21. three different types of expressing requ...

22. What does noise and silence mean in the context of SRS specification?

23. Prescibed _____ and descriptive _____ denote proposed and implemented software architecture.

24. Explain four types of software maintenance through example for the system of "WhatsApp"!

[a] 1)Adaptive
2) Corrective
3) Perfective
4) Preventive

[b]

[c]

[d]

25. Components _____, Connectors _____, _____

Configuration _____, Context _____,

Constraints _____ are the five C's of Software Architecture (as discussed in the course)

C. **Short Answer Questions (5X5=25 marks)**

26. Fill the below table with appropriate UML symbols and their meaning for an example case study

	Draw the Symbol	What do that symbol mean?
Aggregation		
Composition		
Generalization /Inheritance		
Multiplicity		
Stereotypes		

guish between bones versus cosmetics in User interface design. Write 4 Do's and s during UI design

	Don'ts

29. What are the three different categories of design patterns (one sentence on each and one example pattern name for each)? Draw the pattern structure diagram for Abstract Factory Design pattern and illustrate it with an example in the context of a mobile manufacturing company.

30. **Write five different kinds of UML Diagrams, their purpose and with a simple example**

UML Diagram	Main purpose

E. Long Answer Thinking Questions (1X10=10 marks)

The following questions focus on your knowledge and application of software engineering principles to design of software systems. Clearly state your assumptions before you write answers to the questions.

31. Assume that you lead the software engineering team entrusted to design an object oriented software system to help our Dean (Academics) to conduct examinations in IIIT Tirupati for different kinds of students (UG, PG...) in different departments, and in hybrid mode. Explain your software solution strategy (bullet points) and write code snippets for this case study to illustrate standard object oriented concepts, SOLID principles and design patterns in object oriented thinking. Briefly write a sentence on each of the principles that you use (why that principle in this context) and write code stubs (not full code) to illustrate the principles [10 marks]
32. Briefly explain the three components of Model-View-Controller Architectural Pattern for designing a video streaming application like Netflix [10 marks]
33. *Chess Game* - Design the architecture of a multi-player online game to play chess. List requirements, explain design decisions, and implementation overview. You may or may not think in terms of *Sessions*, *Games*, *Players*... Will you store the state of the entire game? How will you store moves of the players? How do you generate the moves of the computer and so on? – Write requirements as user stories – 2 marks, architecture – 6 marks, design decisions and rationale -2 marks [10 marks]

F. Design Thinking Question - 20 marks

34. *RapidCourt* - There are a wide range of different cases pending in the Indian judicial system for several decades. There are different kinds of courts present at different locations and at different levels and cases available in multiple languages. There are different sections in the law petition which might be applicable to certain sections of people. You are given the task of designing a software system to handle challenges in the Indian judiciary system. (20 marks)

- What are the key Requirements, Stakeholders and Constraints? - Draw use case diagram with multiple use cases and explain one use case in detail. You should use the fully dressed use case template and should not write standard use cases such as login, *chat* and so on. Selecting an appropriate use case through which you can demonstrate all attributes in the template also has weightage. – 5 marks
- What is the architecture of the proposed system including its structural and behavioural design? 10 marks – (Class and Sequence Diagram)
  - Identify all the classes and interfaces in the system
  - Draw the class diagram that connects all the classes and interfaces
  - Identify the attributes and methods of each of the classes/interfaces along with access specifiers
- What are the design choices? and the rationale for making those choices? (must say why you took a decision over other decisions) Justify them from the lens of SE principles! – 5 marks
- The answer has to be specific and precise and not a generic one, and evaluation will be based on how well you have applied Software Engineering principles. Please list your assumptions for the case study and must follow UML notation

Rough Work

View

What do you depict through the view?