Question 1 [20 Marks]

Fill in the correct answer box for the following multiple-choice question in the below sheet. Overwriting, multiple answers and cutting will result in zero marks.

	A	B	C	D		A	B	C	D
1			✓		11			✓	
2	✓				12	✓			✓
3			✓		13		✓		
4		✓			14				✓
5			✓		15				
6				✓	16	✓			
7			✓		17		✓		
8	✓				18			✓	
9			✓		19			✓	
10		✓			20			✓	

1- Software Engineering focuses on the
- A. Optimization of the Source code
- B. Documentation
- C. Modular breakdown of the system –
- D. Tools, methods, and processes

2- Generic Software products may be
- A. developed for different customers with the same needs. ←
- B. developed for a single customer.
- C. developed for different customers with different needs.
- D. developed for a single customer according to their specification.

3- Which is not true about lightweight process: Agile
- A. development team releases working software small increments.
- B. develops the plans incrementally.
- C. deliverables are incremental working code with maximum documentation. ←
- D. deliverables are an incremental working code with minimum documentation.

4- In _____ phase, Errors and problems are identified by users are fixed.
- A. Review
- B. Testing ←
- C. Operations and deployment
- D. Maintenance

5- Establishing a system architecture, both hardware and software, that matches the requirements are referred to as
- A. Software Architecture
- B. Parallel Design
- C. System Design –
- D. Program Design

6- Selection of appropriate Process model depends on
- A. Choice of Software organization
- B. Choice of Software Manager ✓
- C. Choice of customer
- D. Size of team, deadline and budget requirement

7- A prerequisite to use _____ is that the requirements can be divided into smaller parts.

    A. Prototyping
    B. Rapid application development
    C. Iterative Development
    D. Incremental Development

8- When definition is stable, and Technology is understood with no ambiguous requirements then _____ model must be used.

    A. Waterfall
    B. Spiral
    C. RAD
    D. Prototype

9- In rapid application development (RAD), a development team produces a fully functional software in_____days

    A. 30 – 60   3 – 4 mo.
    B. 60 – 90
    C. 90 – 120
    D. 120 – 150

10- Which model will be used on this situation:

Train company StationWide wants to be reactive to changing requirements as they create software that shows users the trains, they can ride from one place to another. They created a very early prototype of the software during a two-week sprint to get feedback and fix problems the original code had during the next sprint. Daily meetings are used to keep everyone on the same page.

    A. Software Process
    B. Agile Development   scrum is part of Agile type
    C. Prototype Development
    D. None of the above

11- Which of the following statements is not a characteristics of the agile process.?

    A. fixed length increments of 1-6 weeks
    B. products owner/customer available
    C. short feedback cycles
    D. Risk Analysis

12- In XP an automated unit test framework is used to write tests for a new piece of functionality before that functionality itself is implemented.
    A. True
    B. False

13- Removing poor code implementation is key practice of XP, this practice is called.
    A. Cleaning Code
    B. Pair Programming

C. Refactoring

D. Quality Improvement

14- A burn-down chart as used in SCRUM keeps track of the financial expenditure of the project.

A. True

B. False

15- Which one of the following user stories follows the template described in class

A. As a taxpayer, I hate math and want someone else to calculate their tax liability.

B. As a taxpayer, I want Tax liability to be calculated automatically.

C. As a taxpayer, I need automation in tax liability.

D. As a taxpayer, I want to have my tax liability automatically calculated for me, because it is tedious and error-prone to calculate by hand.

16- Consider this requirement and identify which kind of requirement is?

"The system shall allow the user to search for books by author and title."

A. Functional Requirement

B. Non-Functional Requirement

C. Domain Requirement

D. Organizational Requirement

17- Consider this requirement and identify which kind of requirement is?

"The system shall support a minimum of 1000 transactions per hour."

A. Functional Requirement   NFR

B. Non-Functional Requirement

C. Domain Requirement

D. Organizational Requirement

18- Which of the following should a user story not do?

A. Describe one thing the software needs to do for the customer. ✓

B. Be short. ✓

C. Discuss specific technologies.

D. Be written using language the customer understands ✓

19- Which of the following things is wrong with this User Requirement?

"The system shall be built using the Meteor platform for making web and mobile apps in JavaScript."

A. Uses technical jargon that the customer may not understand.

B. Describes implementation technologies.

C. All of the above

D. None of the above

20- Consider a system where, a heat sensor detects an intrusion and alerts the security company."
What kind of a requirement the system is providing?

A. Functional Requirement

B. Non-Functional Requirement

C. Domain Requirement

D. Organizational Requirement

Question 2 [30 Marks]

a. Giving reasons for your answer based on the type of system being developed, suggest the most appropriate generic software process model that might be used as a basis for managing the development of the following systems: [10 marks]

A system to control anti-lock braking in a car. This system is called ABS and is used to prevent you from "locking" up your brakes, or applying so much pressure to your brakes that the axle and your wheels themselves stop turning completely spiral

Software process	Spiral
Reason 1	Alot of Risk is involved!
Reason 2	Frequent testing of the Product would be required.

software application for managing insulin pumps. This software would allow users to program and adjust insulin delivery settings, monitor glucose levels, track insulin doses, and receive alerts for potential issues like low or high blood sugar levels. It could also include features for analyzing data trends and providing insights to optimize insulin therapy.

Software process	Waterfall / incremental.
Reason 1	Requirements are clear and concise.
Reason 2	Not a long project / short project.

A university accounting system that replaces an existing manual system

Software process	Prototype
Reason 1	Extensive data is already present for testing due to an existing manual system.
Reason 2	To automate a manual system, requirements would be getting changed left right and centre, so an evolutionary Prototype would be well suited for this task as changes could easily be incorporated

An integrated cloud-based financial management platform specifically designed for educational institutions

Software process	~~Scrum~~ Iterative
Reason 1	Since it is designed for multiple institution, changes in requirement are bound thus an iterative module would suffice.
Reason 2	Project can be launched quickly.

b. Is software complex or complicated? Please justify your answer with example [5 marks]

Complex doesnt mean complicated, Complex means it has smaller details which need attention. However, complicated or complication arises due to miscommunication and ambiguity. Thus, Software is complex: eg: ATM withdrawl needs to check if PIN is valid, then entered amount is less than credit, then disperse and finally debit the amount from the account. this is a complex scenario. On the other hand if we start using abbreviated terms and jargons which are difficult to understand by the team then complication develops arise: eg: Use RAD for this task. (RAD could be Rapid Application Development or Random Access Development, for the sake of example)

c. A good requirement shall have followed properties Constraints of a Good requirement
• Unambiguous • Testable (verifiable) • Correct • Understandable • Independent • Atomic
• Necessary • Feasible • Implementation-free (abstract) • Clear (concise, terse, simple, precise)
Identify the main characteristic missing in the following requirements. [5 marks]

Sr.	Requirement	Missing Characteristic
1	The system shall resist concurrent usage by many users.	Unambigous.
2	REQ1 Content information shall be stored in a text file	(abstract)
3	The system shall provide the opportunity to book the flight, purchase a ticket, reserve a hotel room, reserve a car, and provide information about attractions.	Atomic ✓
4	The system shall be implemented using ASP	Clear
5	Sometimes the user will enter Airport Code, which the system will understand, but sometimes the closest city may replace it, so the user does not need to know what the airport code is, and it will still be understood by the system.	Necessary

d. Using the technique suggested in requirements chapter, where natural language descriptions are presented in a standard format, write one user requirement and one system requirements for the following function: [10 marks]
The spelling-check and correcting function in a word processor.

User Requirement

The user shall be corrected if he has made a typo.

System Requirement

The System shall check the word entered by the user with its dictionary and replace the word with the closest match if the word is not found.

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Question 3 [10 Marks]

You should attempt this part within 15 minutes.

Read the given case study and attempt the questions below:

Gym company FITFIT is a company that manages many fitness centers, in many cities. FITFIT aims to be a digital gym, where most paperwork is eliminated. Anyone can become a customer by paying a fee that gives access to FITFIT facilities (any facility) for a certain amount of time (day, month, year). Payments can be made only online, using a web site. Access to a center is controlled automatically via turnstiles, in two ways. Using an RFID card, or using a NFC enabled smartphone. The card has to be purchased online (on the same website for payments) and is sent to the customer via courier. Remark that also employees of FITFIT are granted access in the same way. Access to the facilities requires not only payment, but also a medical certificate. A scanned version of the certificate has to be uploaded on the web site. A certificate has a defined duration (one year or less). Not only entrance is through the turnstile, but also the exit. In the following you should analyze and model a client server application to support the FITFIT company. FITFIT company is interested in buying third party APIs for reading RFID cards and NFC enabled components for entry and exit turnstiles to manage access to gym facilities. Moreover, FITFIT company plans to develop this system in an extremely short development cycle with an above-constrained scope.

a. List and justify three functional requirements that could be important for the above system [3 Marks].

FR1	The system shall check for either RFID or NFC before Access is granted.
FR2	The system shall add a customer if they have made a purchase / payed the fee.
FR3	The system shall prompt the customer for a medical certificate ~~and also checking its validity~~ before entry.

b. List and justify five non-functional requirements that could be important for the above system [5 Marks].

Usability Requirement	The system shall check if the payment was made for how long (duration) and store that information accordingly
Reliability Requirement	The system shall check if the medical certificate entered is in range/is valid or not.
Portability Requirement	The system shall check if payments were validated successfully or not.

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Efficiency Requirement	The system shall check if scanned copy is ~~readable~~ or not.
Safety Requirement	The system shall ~~take necess~~ protect the users sensitive information.

c. Which process model would be suitable for the above system and list down one important reason to choose the model [2 Marks].

Model	RAD
Reason	The ~~system result~~ company needs this developed in a short developmental cycle. be developed fast.