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Course Code: 102007052
Course Title: Software Engineering
Instructor: Engr. Ghassan Husnain
Program: BS CS (Software Engineering)   Total Marks: 50 Time Allowed: 4 Hours
Note: Attempt all Questions

Q.1: Explain why the rapid delivery and deployment of new systems is often more important to businesses than the detailed functionality of these systems. *(6 marks)*

Answer: A conventional waterfall or specification-based process is usually prolonged and the final software is delivered to the customer long after it was originally specified. In a fast moving business environment, this can cause real problems. By the time the software is available for use, the original reason for its procurement may have changed so radically that the software is effectively useless. Therefore, for business systems in particular, development processes that focus on rapid software development and delivery are essential. So, rapid delivery focuses on the delivery of the system. It is good for a system that is required to show the result of the system. And, it is good for business since the system can be used early if the essential functionality is available and be later improved as the user requirements change.

Q.2: Explain how the principles underlying agile methods lead to the accelerated development and deployment of software.   *(6 marks)*

Answer: The principles underlying agile development are:

(a) Individual and interactions over processes and tools. By taking advantages of individual skills and ability and by ensuring that the development team knows what each other are doing, the overheads of formal communication and process assurance are avoided. This means that the team can focus on the development of working software.

(b) Working software over comprehensive documentation. This contributes to accelerated development because time is not spent developing, checking and

managing documentation. Rather, the programmer's time is focused on the development and testing of code.

(c) Customer collaboration over contract negotiation. Rather than spending time developing, analyzing and negotiating requirements to be included in a system contract, agile developers argue that it is more effective to get feedback from customer's directly during the development about what is required. This allows useful functionality to be developed and delivered earlier than would be possible if contracts were required.

(d) Responding to change over following a plan. Agile developers argue(rightly) that being responsive to change is more effective than following a plan based process because change is inevitable whatever process is used. There is significant overhead in changing plans to accommodate change and the inflexibility of a plan means that work may be done that is later discarded.

Q.3: Extreme programming expresses user requirements as stories, with each story written on a card. Discuss the advantages and disadvantages this approach to requirements description. (*6 marks)*

Answer: extreme programming(XP) is perhaps the best known and most widely used of the agile method. The name was coined by beck because the approach was developed by pushing recognized good practice

In extreme programming, requirements are expressed as scenarios which are implemented directly as a series of tasks. This program involves a number of practices through incremental planning, small releases, simple design, test first development, refactoring, pair programming, collective ownership, sustainable pace, on-site customer.

Advantages and disadvantages of extreme programming user requirements:

Advantages:
- Scenarios cope with most of common operation. It is easy to identify what type of operation that is required in the user's stories.
- Customer focus in the scenario card increase the chance that the software produced will actually meet the needs of the users.

Disadvantages:
- Using scenarios on a card can bring to a function overlooked or omission which can be a time consuming process to complete the system.
- Two different scenarios can lead to the same function as it will be conflicted each other. Crossing out redundant scenarios can be a cumber some tasks.

Q.4: To reduce costs and the environmental impact of commuting, your company decides to close a number of offices and to provide support for staff to work from home. However, the senior management who introduce the policy are unaware that software is

developed using agile methods, which rely on close team working and pair programming. Discuss the difficulties that this new policy might cause and how you might get around these problems. *(8 marks)*

Answer: If the company decided to close down a number of offices that were specialized in using agile methods they may face a multitude of difficulties. When a company is driven by a close team and is divided they will be unable to have daily meetings, which can cause issues with communication, programming in pairs would not be possible, a communication gap would be created, productivity will slow down due to communication issues, and detecting errors would be quite difficult. These problems can be avoided by creating merging offices together so pair programming and daily communication can be established. If that is not possible, a communication platform consisting of Webcams, desktop viewing software, and microphones should be created to allow better communication.

Q.5: Identify and briefly describe four types of requirement that may be defined for a computer-based system. *(6 marks)*

Answer: Generally, system requirements are intended to communicate the functions that the system should provide. And every computer based systems consists of many requirements. They are,

User requirements: These requirements are the statements in a natural language plus diagrams of the services the system provides and its operational constraints.

System requirements: A structured document setting out detailed descriptions of the system's functions, services and operational constraints. Defines what should be implemented. It may be part of a contract between client and contractor.

Functional requirements: These are the statements of services that the system should provide, how the system should react to particular inputs and how the system should behave in particular situations.

Non functional requirements: Constraints on the services or functions offered by the system such as timing constraints, constraints on the development process, standards, etc

These requirements are usually applied to the system as a whole rather than individual features or services.

Q.6: Using your knowledge of how an ATM is used, develop a set of use cases that could serve as a basis for understanding the requirements for an ATM system. *(10 marks)*

Answer: Use cases are generally a set of interaction between the user/actor with the system to generate a desired output.

A use case diagram is a graphical representation of all use case that interacts with the system. Use case diagram is part of unified modeling language also known as UML.

Set of use cases that are used in this ATM use case diagram to understand the requirements of the ATM are given below:

- Insert ATM card
- Enter pin
- Perform required transaction
- Withdrawal
- Deposit
- Transfer
- Change pin
- Exit

Both customer and bank are treated as actor. Actors are the one who interacts with the system.

Q.7: Suggest how an engineer responsible for drawing up a system requirements specification might keep track of the relationships between functional and non-functional requirements. *(8 marks)*

Answer: Functional requirements describe what the system will do.

EX: inputs and outputs.

Non functional requirements describe the expectations but it is not concerned with the system.

Ex: security

While drawing up a system requirements specification, an engineer might keep track of the functional and non-functional requirements by ensuring the following:

- The requirements needed to design meets the requirements such as compatibility, portability etc.
- Design the system so that it ensures the safety and security.
- Implementing the system in an efficient manner.
- The cost and time required for the development should not affect the design and implementation of the system.

Here, the non-functional requirement defines what are the expectation to get out and the user requirements.

The functional requirement defines the use of the developer knowledge.

It does not conflict with each other.

The first step is to make the systems requirement document.
It is engineer responsibility to prepare documents to each functional and non-functional requirement.

- The engineer needs to prepare the document depending on this, non functional requirements need the natural language and functional requirements need the structured language to understand better.

- It gives the matrix that shows each requirement related to each other.

- It is very difficult to manage because the functional and non-functional requirements put efforts with each other on track of relationships.

- Non-functional requirements linked with functional requirements to list, identify the system levels that have been related each other.

- The engineer needs to prepare the way to link the functional to non functional to implement it.

- The functional requirements enforce the non functional requirements that shall be recorded and tracked.

For example, the user needs to search for the candidate list for the interview.

It is a functional requirement.

That the search should return all the list of candidates who are attending the interview.

It is a non functional requirement.

Therefore, it helps the engineer to avoid overlap and that relates to each other.

And it keeps track the relationships between functional and non-functional requirements.

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