Homework #1 (AXK180025)

1. What is software process? Please provide a list of five software processes with a brief description.

A) **Software Process**: A software process is a series of phases of activities performed to construct a software system. Each phase produces some artifacts which are input to other phases. Each phase has a set of entrance criteria and a set of exit criteria.

   1. **Prototyping Process**: The prototyping process recognizes the mismatch between the newly constructed software system and users' expectations, and challenge to deliver the capabilities with in time and budget constraints. As a solution, a prototype of system is constructed and used to acquire and validate requirements. They are also used in feasible studies as well as design validation. A prototype can be very simple or very sophisticated.

   2. **Evolutionary Process**: Incremental development is based on the idea of *developing an **initial implementation**, exposing this to user **feedback**, and evolving it through several versions until an acceptable system has been developed*. The activities of a process are not separated but interleaved with feedback involved across those activities. Each system increment reflects a piece of the functionality that is needed by the customer. Generally, the early increments of the system should include the most important or most urgently required functionality.

   3. **Spiral Model**: The spiral model is a risk-driven where the process is **represented as spiral** rather than a sequence of activities. It was designed to include the **best features from the waterfall** and prototyping models and introduces a new component - **risk-assessment**. Each loop in the spiral represents a phase. Thus, the first loop might be concerned with system feasibility, the next loop might be concerned with the requirements definition, the next loop with system design, and so on.

   4. **Unified Process**: The Rational Unified Process (RUP) or Unified Process (UP) consists of a series of cycles. Each cycle concludes with a release of each system. Each cycle has several iterations. The iterations are grouped into four phases – inception, elaboration, construction and transition. Each iteration goes through a series of workflow activities, including requirement analysis, design, implementation and testing.

   5. **Agile**: The waterfall model works for tame problems because such problems possess several nice properties. Application software development is a wicked problem. Agile process is designed to solve such wicked problems. Agile process emphasizes team work, joint application development with the users, design for the change and rapid development and frequent delivery of small increments in short iterations.

2. What is a software development methodology? What is/are the difference(s) between software process and software development methodology?

A) **Software Development Methodology**: A software development methodology defines the steps or how to carry out the activities of a software process. It is a framework that is used to structure, plan, and control the process of developing an information system. This includes the pre-definition of specific deliverables and artifacts that are created and completed by a project team to develop or maintain an application.

Software Process:
- Defines a framework of phased activities.
- Specifies phases of WHAT
- Usually does not dictate representations of artifacts
- Hence, it is paradigm-independent
- A phase can be realized by different methodologies.

Example: Waterfall process, Spiral process, Prototyping process, Unified process, Personal software process, Team software process, Agile etc.,

Software Development Methodology:
- Amounts to a concrete implementation of a process
- Describes steps of HOW
- Defines representations of artifacts
- Hence, it is paradigm-dependent
- Each step describes specific procedures, techniques, and guidelines etc.,

Example: Structures analysis/structured design methodology (SA/SD), Object Modeling Technique, Agile methods like Scrum, Dynamic Systems Development Method (DSDM), Feature Driven Development (FDD), Extreme Programming (XP) etc.,

3. Please provide a list of five different Agile methods with a **brief** description.

A)

1. **Dynamic Systems Development Method (DSDM)**: It is a framework that works with Rational Unified Process and extreme programming. It is based on the 80-20 principle. It is suitable for agile or plan-driven projects. The end products include a feasibility report, an outline project plan, and optionally a prototype that is built to access the feasibility of project. Prioritized requirements are made along with architectural design. Identifying prototype functionality, building, reviewing, and approving

prototype in iterations. Building a system and conducting beta test. Then deploying system and access impact to business.

2. **Scrum**: It includes scrum master, product owner, and team roles. It has 15-minute status meeting to improve communications. Team retrospective meeting to improve process. Identifying and prioritizing requirements than can be delivered within an increment called sprint. It has sprint planning meeting to determine what and how to build next. There is daily scrum meeting for team members to report status. It allows team members to improve understanding. The team retrospective allows the team to improve its practices.

3. **Feature Driven Development (FDD)**: It consists of 6steps or phases. The first three are performed once and last three are iterative. The domain expert provides walkthrough of overall system and developers create the object models and in together they produce overall model of a system. The features list is produced representing business functions delivered by the system. Incremental development and deployment of the features, according to priorities and dependencies. The team is organized as chief programmer team organization. The classes assigned to developer are called class owners.

4. **Extreme Programming (XP)**: It is mostly useful for small teams facing vague and changing requirements. It has 6 phases. The development team and customer jointly develop user stories. They also explore available technologies and conducts a feasibility study for project. In planning, user stories are created for next release. They require minimum of 6 months for each user story to implement. The customer selects the user stories and they are implemented and tested iteratively until deployment. Then, issues such as performance, reliability, are addressed and removed. Later stage system undergoes enhancements, refactoring. When the project is done, it enters the death phase in which documents are released.

5. **Agile or Plan-Driven**: Agile works well for small to medium size projects that require frequent changes in requirements. Plan-driven approaches may remain the choice for large, complex systems and equipment manufacturers where predictability is important. The challenge in this is to balance the two approaches to take advantages of their strength and compensate for their weakness. Methods such as Crystal Orange, DSDM, Lean Development, lightweight unified process, are those which can adapt to the cultures and circumstances of different software projects.

4. A good software development methodology is associated with number of benefits. Please list five benefits

A) **Benefits of Methodology**:

1. A good methodology enables the software development team to focus on the important tasks and know how to perform these tasks correctly to produce the desired software system.

2. A good methodology improves communication and collaboration because:
   - The methodology defines a common language for modelling, analysis, and design.
   - The methodology defines the steps for effectively carrying out a development task that everybody knows and follows
3. A good software methodology improves design quality and software productivity because
   - The software engineers are employed to correctly and effectively apply the modelling, analysis, and design concepts and tools to construct the system.
   - The peer-review guidelines or checklists enable software engineers to conduct effective inspection and peer reviews to identify flaws in the requirements specification, design, and source code. These in turn reduce testing, debugging and maintenance costs.
4. A good methodology forms the basis for process improvement because measurements of software quality, productivity, cost and time to market can be defined and applied to identify strengths and weakness.
5. A good methodology forms the basis for process automation because many of the methodological steps can be mechanically carried out, making software automation much easier.

5. Please provide a **brief** comparison between software processes

A)

No	Features	Prototype	Evolutionary	Spiral	Unified	Agile
1	Requirement Specification	Not all and frequently changed	Not all and frequently changed	Not all and frequently changed	Yes	Not all and frequently changed
2	Overlapping Phases	Yes	Yes, as parallel development is there	No	No	Yes
3	Process	Light weight	Light weight	Heavy weight	Heavy weight	Light weight
4	Framework Type	Iterative	Combination of linear and iterative	Combination of linear and iterative	Iterative and incremental	Iterative and incremental
5	Testing	After every iterative prototype model	After Every Iteration	At the End of Engineering Phase	At the Construction Phase	After coding phase

6	Customer Involvement	High, After Each Iteration	High, After Each Iteration	Low, After Each Iteration	High, After Each Iteration	High
7	Flexibility	Much Flexible	Much Flexible	Much Flexible	Very Flexible	Very Flexible
8	Availability of Working Software	At the End of Every Iteration	At the End of Every Iteration	At the End of Every Iteration	At the End of the life cycle	At the End of Every Iteration
9	Primary Objective	Rapid Development	Rapid Development	High Assurance	High Assurance	Rapid Development
10	Release Cycle	In Phases	In Phases	Big band (All Functionality at Once)	Big band (All Functionality at Once)	In Phases

6. Please provide a brief comparison between methodologies that you listed in Q3. Which one you think is a best fit for our class project and why?

A)

No	Features	XP	Scrum	DSDM	FDD	ASD
1	Approach	Iterative increments	Iterative increments	Iterative	Iterative	Incremental
2	Iteration time	1-6weeks	2-4 weeks	80% in 20% time	2 days – 2 weeks	4-8 weeks
3	Team Size	Small Teams (<20)	All Sizes	All Sizes and Independent Teams	Many Members and More Than One Team	Small Team (5-10)
4	User Involvement	Highly Involved	Through Product Owner	Through Frequent Releases	Through Reports	Through Frequent Releases
5	Documentation	Only Basic Documentation	Only Basic Documentation	Documentation Exist	Documentation Is Important	Only Basic Documentation
6	Major Practices	User Stories, Test Driven Development, Refactoring, Pair Programming	Sprint, Product and sprint backlog, Scrum Meetings	Prototyping, Feasibility & Business Study	UML Diagrams	Learning Diagrams

7.Do following for the Car Rental System (CRS) given in eLearning.

   a. Identify and formulate requirements and constraints
   b. Provide priority weights for the requirement according to the nature of the car rental business.
A)

RNo	Requirements	Priority Weight
1	Customer should be able to select the location of his pick up and drop which can be same/different location.	5
2	An additional charge should be levied on customer if he drops the car at different location.	3
3	The rental plans and offers should be displayed when the customer want to select a car.	5
4	Different makes of car of different manufacturers should be available for customer to choose.	4
5	Several models of car should be made available from each make of car for customer to choose.	4
6	Information of each car should be displayed when user selects the specific car and prices should vary according to the type.	5
7	Price classes are listed should be assigned accordingly for different make and model.	5
8	An error message should be displayed when the customer selects a car which is not available and suggest similar car make and model.	5
9	Reservation can be done in person at the company.	5
10	Reservation can be done by using reservation form online.	5
11	Reservation is voided if customer doesn't show up to sign the contract at given period.	5
12	The voided reservation can be accepted if the car requested is still available.	4
13	When Block reservation are made invoices should be handled for all the reservations.	3
14	The invoice should be opened when the car is checked out.	5
15	An invoice should be able to handle multiple rentals.	4
16	Any Invoice should be settled by customer.	5
17	When the invoice handles multiple rentals then the customer and company must settle invoice together.	4

18	When payment is done through credit card, it should be processed through credit card processing company.	4
19	Rental car will maintain a status saying available or in maintenance.	5
20	Car availability should be updated daily according to its status.	4
21	Damage/Repair of car should be handled immediately by informing the support team about its the damage/repair details.	4
22	Rental history, repair, maintenance, disposal, information should be tracked for each car.	5