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**GROUP ASSIGNMENT OF SOFTWARE ENGINEERING**

**QUESTION ONE**

**Read carefully and understand the case study below to answer the two questions. Be as innovative as possible.**

**The railway reservation system functions as follows;**

**The passenger is required to fill in a reservation form giving detail of his journey. The counter clerk ensures whether the place is available. If so, entries are made in a register, tickets are prepared, amount is computed and cash is accepted.**

**A booking statement is prepared in triplicate format from the reservation register. One copy is retained as office copy, the other is pasted to the compartment and third is passed on to the train conductor. Besides booking statement, cash statement is prepared at the end of each shift.**

**Prepare System Require Specification and system specification for above system problem.**

**System Require Specification.**

1. **Functional Requirement.**

**Statement Generation-** At the end of each shift, the system ought to provide a cash statement and a booking statement in triplicate.

**Reservation Form-** The reservation form should be easy to use and allow the system to gather travel information.

**Booking Process-** Confirmed reservations should be entered into the reservation register, with tickets printed, the amount calculated, and cash taken.

**Seat Availability Check-** The system must verify seat availability for the given journey.

1. **Non-Functional Requirement.**

**Reliability-** Financial data and seat availability should be accurately updated and maintained by it.

**Performance-** The system ought to manage several transactions at once without sacrificing accuracy or speed.

**Security-** The system needs safeguards against unauthorized access to sensitive data and to guarantee data confidentiality.

**Usability-** Both the counter clerk and the passengers should find it simple to operate and navigate the system.

**System Specification.**

1. **User Interface.**

* An easy-to-use reservation form with fields for travel information (such as destination, date, and class) should be included in the system.
* An interface for counter clerks to enter data, verify seat availability, and take payments.

1. **Workflow.**

* Update the reservation registration as soon as a reservation is confirmed.
* Create the tickets and figure out the total cost.
* At the conclusion of each shift, accept cash payments and produce a cash statement.

1. **Error Handling**

* Send out error messages or warnings in case of things like invalid form entries or unavailable seats.
* Put error recovery procedures in place in the event that the system fails.

1. **Security and Compliance.**

* Authenticate users so that clerks can access the system.
* Verify adherence to data protection and financial laws.

1. **Database and Data Handling.**

* To keep track of reserved seats and tickets, keep a reservation register.
* Produce booking statements in three different file formats.
* For each shift, keep track of and record the money transactions.

**Question 2**

**Discuss the following software testing techniques (walkthroughs, reviews and inspections, dynamic testing, Traceability matrices. Debugging environments)**

1. **Walkthroughs, Review and Inspection.**

These are methods of static testing that concentrate on examining designs, codes, or documents. They entail a team of individuals reviewing the programme or papers associated with it to identify flaws, enhance quality, and guarantee adherence to standards. Walkthroughs are less formal and more regimented than reviews and inspections.

1. **Debugging Environment.**

Finding, locating, and resolving software problems or issues are the steps in the debugging process. Debugging environments, such as integrated development environments (IDEs) with debugging features, log analysis tools, or specialized debugging software, give developers the means and means to monitor and fix these problems.

1. **Dynamic Testing.**

This entails running the software in order to monitor its behavior, identify any bugs, and evaluate its functionality. It covers a range of techniques, including acceptability testing, system testing, integration testing, and unit testing. Using dynamic testing to run the software and evaluate its performance is essential for finding flaws.

1. **Traceability Matrices.**

These matrices define connections between requirements, design, and testing, among other stages of development. They facilitate thorough test coverage and tracking throughout the software development life cycle by assisting in ensuring that every requirement is connected to the tests that validate it.

**Question 3**

**Discuss Software Quality Evaluation – Problems, Software standards, Certification, Software Tools support for Systems Engineering**

1. **Problem in Software Quality Evaluation.**

There are several difficulties in assessing the quality of software. These include the use of subjective standards to evaluate quality, the challenge of quantifying non-functional characteristics (such as maintainability or usability), the absence of metrics that are widely recognized, and the evolution of standards as a result of technical breakthroughs. Furthermore, making sure the software is error-free and satisfies user needs presents a constant.

1. **Software Standards.**

To guarantee the quality of software, a number of standards have been established. For example, functionality, dependability, usefulness, efficiency, maintainability, and portability are all defined as quality attributes in ISO/IEC 9126. Additional standards include industry-specific recommendations such as those for medical devices or automotive software, IEEE standards for software engineering, and CMMI (Capability Maturity Model Integration).

1. **Certification.**

Software must be certified by having it evaluated and validated by a third party in accordance with predetermined criteria. It offers a certain degree of assurance that the programme satisfies quality standards. ISO certifications and industry-specific certifications (medical equipment according to FDA rules, for instance) are two examples.

1. **Software Tools Support for System Engineering.**

System engineering uses a variety of technologies to enhance software quality. Activities including requirements management, system design, modelling, testing, and quality assurance are supported by these technologies. Software systems quality and consistency are ensured by using tools such as version control systems like Git, testing frameworks like Selenium or JUnit, Unified Modelling Language (UML) tools for design, and IBM Rational DOORS for requirements management.

**Question 4.**

**Discuss CASE tools as used in Web engineering techniques and process, standards and guidelines.**

1. **Web Engineering Techniques**

**Requirement Gathering and Modelling-** Web application requirements are gathered and modelled with the help of CASE tools. They provide resources for making flowcharts, diagrams, and other models that accurately depict user requirements.

**Design and Prototyping-** These tools facilitate the design and prototyping of websites. They provide tools to create interactive prototypes, mockups, and wireframes, which let developers and designers see and adjust the structure and layout of the online application.

1. **Web Engineering Process.**

**Code Generation and Development-** Code creation is a common feature of CASE tools. They can reduce human coding errors and increase development productivity by automatically generating code based on the design and specifications.

**Testing and Quality Assurance-** Web application testing functionalities are included in several CASE products. To make sure the online application satisfies quality requirements, they provide automated testing, bug tracking, and quality assurance.

1. **Standards and Guideless.**

**Compliance with Web Standards-** Adherence to online standards, including as HTML, CSS, and accessibility rules, is supported by a number of CASE tools. To make sure that these standards are being followed, they might provide validators, checks, and templates.

**Collaboration and Version Control-** CASE tools can facilitate teamwork and version control to guarantee that the development of the web application follows accepted standards and best practices.

**Question 5.**

**Discuss Process Improvement (PI): - Quality and process standards and guidelines**

Process Improvement (PI) involves enhancing the processes within an organization to increase efficiency, quality, and overall performance. Quality and process standards and guidelines play a significant role in PI initiatives.

1. **Quality Standards.**

**Iso Standards-** A framework for quality procedures is provided by International Organization for Standardization (ISO) standards, such as ISO 9001 for quality management systems. Satisfied customers and consistent quality are guaranteed when these criteria are followed.

**Industry-Specific Standard-** Different sectors have different requirements for quality. For instance, the Capability Maturity Model Integration (CMMI) offers a framework to assess and enhance process maturity in software development.

1. **Process Standard and Guidelines.**

**Regulatory Compliance-** Regulations governing procedures that guarantee adherence to legal obligations and moral principles are found in many different businesses. Following these procedures is essential in industries including healthcare, banking, and aviation.

**Best Practices-** Adopting industry-established best practices and guidelines is a common step in process improvement. Project management, software development techniques, quality assurance procedures, and other topics might be covered by these rules.

1. **Continuous Improvement Framework.**

**Six Sigma-** Through the identification and elimination of fault causes, this methodology seeks to improve the quality of process outputs. It employs statistical techniques in an organized manner.

**Learn Methodology-** Lean emphasizes reducing waste and boosting productivity through process analysis so that more value may be produced with fewer resources.

1. **Guidelines for Implementation.**

**Quality Management System (QMS)-** ISO 9001 and other QMS standards and guidelines offer an organized method for controlling and enhancing quality inside an organization.

**Documented Processes-** Implementing and sustaining process and quality improvements is aided by documented and standardized procedures. They guarantee uniformity and offer a point of reference for ongoing improvement.