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**Software Engineering Assignment**

QUESTION

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 details 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 an office copy, the other is pasted to the compartment and third is passed on to the train conductor. Besides booking statements, a cash statement is prepared at the end of each shift.

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

Design a prototype for the case study

Answer:

System Requirement Specification:

1. Functional Requirements:

a. Reservation Form: The system should provide a reservation form for passengers to fill in their journey details.

b. Availability Check: The system should check the availability of seats for the specified journey.

c. Reservation Entry: If seats are available, the system should allow the counter clerk to make entries in the reservation register.

d. Ticket Preparation: The system should generate tickets for the reserved seats.

e. Amount Computation: The system should calculate the fare amount based on the journey details.

f. Cash Acceptance: The system should accept cash payments for the reserved seats.

g. Booking Statement: The system should generate a triplicate booking statement from the reservation register.

h. Cash Statement: The system should generate a cash statement at the end of each shift.

2. Non-Functional Requirements:

a. Reliability: The system should be reliable and available for booking throughout the operating hours.

b. Performance: The system should handle multiple reservation requests simultaneously and provide a quick response.

c. Usability: The system should have a user-friendly interface for passengers and counter clerks to interact with.

d. Security: The system should ensure the confidentiality and integrity of passenger information and payment details.

e. Scalability: The system should be scalable to handle a large number of reservations during peak times.

f. Maintainability: The system should be easy to maintain and update with new features or changes in business rules.

System Specification:

1. User Interfaces:

a. Passenger Interface: A user-friendly interface for passengers to fill in their journey details and make reservations.

b. Counter Clerk Interface: An interface for the counter clerk to check availability, make entries, and accept cash payments.

2. Database:

a. Reservation Register: A database to store reservation details, including passenger information and reserved seats.

b. Cash Statement Database: A database to store cash statements at the end of each shift.

3. Business Logic:

a. Availability Check: The system should have a mechanism to check seat availability based on the journey details.

b. Fare Calculation: The system should calculate the fare amount based on the journey distance and other factors.

c. Ticket Generation: The system should generate tickets with unique ticket numbers for the reserved seats.

d. Booking Statement Generation: The system should generate triplicate booking statements with relevant reservation details.

e. Cash Statement Generation: The system should generate cash statements summarizing the cash transactions for each shift.

Prototype Design:

The prototype for the railway reservation system can be designed as follows:

1. Passenger Interface:

a. A web-based or mobile application where passengers can enter their journey details, select the desired seats, and make reservations.

b. The interface should provide real-time seat availability information and dynamically update the seat selection options.

c. Passengers should be able to view the fare amount, make online payments, and receive digital tickets.

2. Counter Clerk Interface:

a. A desktop application for counter clerks to access the reservation system.

b. The interface should provide a search functionality to check seat availability and make reservations on behalf of passengers.

c. Counter clerks should be able to generate physical tickets, accept cash payments, and print booking and cash statements.

3. Database:

a. A centralized database to store reservation details, passenger information, seat availability, and cash statements.

b. The database should be securely accessible by both the passenger and counter clerk interfaces.

4. Integration:

a. The reservation system should be integrated with payment gateways to facilitate online payments.

b. The system should also integrate with ticket printers to generate physical tickets for passengers.

5. Reporting:

a. The system should have reporting functionality to generate various reports like daily reservations, revenue summaries, and occupancy rates.

Note: The above prototype design is a high-level representation, and detailed implementation considerations may vary based on the specific technologies and requirements of the railway reservation system.

Question 1

Discuss the following software testing techniques

Answer:

a).Walkthroughs-Are software development techniques used to review and evaluate a project, system or piece of software to identify issues and improve the quality of the product.

Aspects of Walkthroughs

-purpose; walkthrough is primarily used for early-stage inspection and assessment of a software project.

-participants; walkthrough involves group of individuals, including developers, testers and stakeholders.

-process; Begins with a review leader guiding participants through the software or document review.

Benefits of walkthrough

-Early detection of issues; walkthrough help to identify defects and issues at an early stage, reducing cost and effort required for correction.

-Knowledge transfer; facilitates knowledge sharing among team members and promote better understanding of software.

-Improved collaboration; walkthrough encourages collaboration and communication among stakeholders. Limitations

-Time-consuming; walkthrough can be time consuming especially for large and complex software.

-Resource intensive-walkthrough require diverse group of participants.

Types of walkthroughs

-formal walkthrough; Has specific agenda and detailed documentation finding.

-informal walkthrough; Less structured

.-Technical walkthrough; Focused on technical aspects.

-management walkthrough; concerned with high-level issues.

B).Reviews and Inspection- Are systematic and structured evaluation techniques used in software development to access the quality, correctness and completeness of software artifacts.

Aspects of Reviews

-purpose; reviews are conducted to evaluate a software artifact at various stages of development process.

-participants; Involves group of participants which may include developers, testers and designers.

-process; consists of a preparation phase where participant familiarize themselves with the artifact to be reviewed.

Benefits

-quality improvement; contribute to improved software quality and reliability.

-Early defect detection; review catch defect early.

-knowledge sharing; facilitates knowledge transfer.

Limitation

-Time- consuming;large reviews may take long to complie hence consuming time

-resource intensive; reviews require participation of various team members which can be resource intensive.

Aspect of Inspection

-purpose;inspection is formal type of review focused on identifying defects.

-participants; involves well-defined team.

-Process; inspection follow highly structured process with detailed checklist and procedures.

Benefits

-high quality assurance; provides rigorous approach making them highly effective in defect detection.

-standardization; ensures consistency and thoroughness.

Limitations

-time consuming; nature makes it time consuming.

-resource intensive; it is more resource intensive.

C).Dynamic testing- involves execution of software being tested to observe its behavior, performance and functionality.

Types of Dynamic Testing

-Functional testing; check if software function according to its specification.

-non-function testing; evaluates aspects such as performance.-security testing; focus on identifying vulnerabilities and security weakness.

d).Debugging environment- refers to the tools and condition that software developers use to identify and resolve defects in their code.

Components of debugging environment

-Integrated development environment(IDEs); i.e visual studio, Eclipse provide comprehensive debugging environment.

-Debugger; allow developers control execution of their code.

-Breakpoints; markers placed in the code that pause execution when reached.

-Remote debugging; Debugging environment may support remote debugging allowing developers to debug code running on different machine.

Question 2

Discuss software quality evaluation-problems, software standards, certification, software tools support for system engineering.

Answer:

Software quality evaluation- involves assessing the quality attributes of a software product ensure it meets defined criteria and standards.

Aspects of software quality evaluation.

a).Problems in software quality evaluation;

-subjectivity; assessing software quality can be subjective as it depends on perspective of the evaluator.

-changing requirements; software quality evaluation can be challenging when requirement are not well-defined.

-resource intensity; comprehensive software quality evaluation require significant time and resources.

B).Software standards;

-software quality evaluation often relies on industry-specific standards and best practices. For example, ISO 25010 defines a comprehensive set of software quality characteristic, such as functionality, reliability, usability and efficiency.

C).Certification;

-certification of software, particularly in safety-critical industries like aviation and healthcare, is crucial. Organization seek certification like DO-178C9(for airborne systems ) or ISO 13485(for medical devices) to demonstrate that their software meets strict quality and safety standards.

Software tools support for system engineering-They play a vital role in supporting system engineering processes which involves defining, designing and managing complex systems.

Here are some ways software tools assist in system engineering;

-requirement management tools for example IBM.-modelling and simulation tools for example SysML-based modelling platform.

-configuration management tools for example Git.

-project management tools for example JIRA.

-quality assurance and testing tools for example TestRail.

-risk management tools for example RiskWatch.

-validation and verification tools for example automated testing.

Question 3

Computer Aided Software Engineering (CASE) tools are used to automate steps in the Software Development Life Cycle (SDLC).They are used by engineers, analysts, and project managers to create software systems.

Diagram tools - The components of the system, data flow, control flow among the various components of software and the structure of the system can be represented in graphical form using diagram tools.

Process Modeling - The software process model can be created using process modeling tools for software development. The managers can choose a process model using process modeling tools or make modifications depending upon the software product requirements.

Project Management - Planning of the project, estimation of cost and efforts, scheduling of project and planning of resources can be done using project management tools. All the steps in the execution of the project must be strictly followed by the managers in management of software project. The project information can be stored and shared in real time using the tools of project management throughout the organization.

Documentation tools - Before the beginning of software process, documentation of the software project must begin. This documentation must cover the all the software development life cycle phases and the completion of the software development phase as well. The documents are generated by the documentation tools for both technical and end users. The in-house professionals in the development team who refer the manual maintained for the system, manual maintained for reference, manual for training, manuals for installation etc. make the technical users. The functioning of the system and how system works is described in the end user documents.

Analysis - Requirements gathering, inconsistency checks, diagrams inaccuracy, redundancies in the data etc. can be checked using analysis.

Design - The block structure of the software can be designed by the software designers using design tools which are again broken down into smaller modules using techniques of refinement. The detailing of every module and the interconnections between the modules can be done using this.

Configuration Management tools - Whenever one version of software instance is released, configuration management tools deals with the following: Automatic tracking, management of version, and management of release can be done with the help of configuration management.

Programming - The programming environments like integrated development environment , library consisting of in built modules, simulation are all included in programming tools. The development of software product is aided by these and simulation and testing features are included.

Prototyping - The simulated version of the software product to be built is called a prototype in software. The look and feel of the product is provided by the prototype and several aspects of the actual product can be simulated using prototyping. Graphical libraries are contained in the prototyping tools. User interfaces and design that are hardware independent can be created using prototyping. Rapid prototypes can be built using prototyping based on the existing information. The software prototype can be simulated using prototyping tools.

Web Development - The web pages like forms, text, script, graphic etc. can be designed using web development tools. The web page that is being developed can be previewed to see how it looks after completion using web development.

Quality Assurance - Monitoring the engineering process and methods used for software development to ensure the quality is as per the standards of the organization can be performed using quality assurance tools. The configuration change control and software testing tools come under the category of QA tools.

Maintenance - If there are any modifications after the delivery of the software product can be done through software maintenance tools. Techniques for automatically logging, error reporting, generation of error tickets automatically and root cause analysis are used in the maintenance phase of the software development life cycle to help the software organizations.

Question 4

PI methodologies, quality and process standards and guidelines play a crucial role in web engineering. They help in ensuring the efficiency of the development process and the quality of the end product.

PI can be applied to various stages of the web development process. For instance, the Six Sigma methodology, a type of PI that aims to minimize the amount of variations within the end product. This process uses statistical data as benchmarks to help business leaders understand how well their processes work. A process is considered optimized if it produces less than 3.4 defects per one million cycles.

As for quality and process standards and guidelines in web engineering, the ISO/IEC/IEEE 90003:2018 provides guidance for organizations in the application of ISO 9001:2015 to the acquisition, supply, development, operation, and maintenance of computer software and related support services. It does not add to or otherwise change the requirements of ISO 9001:2015. These standards ensure that software is being built with quality in mind and is following the correct procedures.