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| **Lab Manual**  **Software Engineering (Pr)**  **COT- 216&IT- 313** | | | |
| L T P  - - 3 | | | Practical exam: 40  Sessional: 60 |
| **PART-I** | | | |
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| **Experiment 1 (Role of Software)** | | | |
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| **Objective** | Toidentify the role of the software in today’s world across a few significant domains related to day to day life. | | |
| **Background** | Software has made the world a global village today. The impact of software spans across almost all aspect of human life. All organizations,Institutions and companies are leveraging the potentials of software in automating the critical functions and eliminating manualinterventions. Software is also a predominant are for trade and export especially for the countries like India. Domains like health care, Airlines , financial Services, Insurance , retails, Education, and many more have exploited software and still there a lot of the scope for software to create impact and add values in multiple dimensions. | | |
| **Problem Description** | In the context of this background, indentify the areas (or application or systems) how software has been leveraged extensively in the following domains,   1. Health Care 2. Airlines 3. BankingInsurance 4. Retail 5. Education | | |
| **Estimated time:** | **60 minutes** | | |
| **Experiment 2 (Software Crisis)** | | | |
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| **Objective** | To identify the problem related to software crisis for a given scenario | | |
| **Background** | In the early years of computers applications, the focus of the development and innovation were on hardware. Software was largely views as an afterthought. Computer Programming was an art. Programmers did not follow any disciplined or formalized approaches.  This way of doing things was adequate for a while, until the sophisticated of computer applications outgrow. Software soon took over and more functions which were done manually. A software houses begin to develop for widespread distribution. Software development projects produced thousands of source program statement. With the increase in the size and complexity of the software, following situation resulted is collectively termed as software crisis.   1. Time Slippage 2. Cost Slippage 3. Failure at customer Site 4. Intractable Error after delivery | | |
| **Problem Description** | In the context of this background, for each of the scenario mentioned below, identify the most appropriate problem related to softwarecrisis and mention the same in the table provided. | | |
| **Scenario A** | Railways reservation software was delivered to the customer and was installed in one of the metro station at 12.00 AM (mid-night) as per the plan. The system worked quite fine till the next day 12.00 PM(noon). The system crashed at 12.00 PM and the railways authorities could not continue using software for reservation till 02.00 M. It took two hours to fix the defect in the software in the software. | | |
| **Scenario B** | A polar satellite launch vehicle was scheduled for the launch on August 15th. The auto-pilot of the rocket to be delivered for integration of the rocket on may 15th. The design and development of the software for the auto-pilot more effort because of which the auto-pilot was delivered for the integrationon June 15th (delayed by a month). The rocket was launched on Sep 15th(delayed by a month). | | |
| **Scenario C** | Software for financial systems was delivered to the customer. Customer informed the development team about a mal-function in the system. As the software was huge and complex, the development team could not identify the defect in the software. | | |
| **Scenario D** | Due to the defect in the software for the baggage handling system. There was also of & 2M of revenues for the airport authorities.   |  |  | | --- | --- | | **Scenario** | **Situation (as given A to D)** | | A |  | | B |  | | C |  | | D |  | | | |
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| **Estimated time:** | **60 minutes** | | |
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| **Experiment 3 (Software Development Model)** | | | |
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| **Objective** | To identify the suitable software development model for the given scenario. | | |
| **Background** | “ABC” is a new enterprise recently started by a few young entrepreneurs, intended to develop robotic systems using IT based solutions. “TENZ” is a well-established automobile manufacturing plant, Interested in automating some of the operations of the plant.  As first step towards automation, TENZ has decided to deploy a robotic arm to pick and place large number of bolts from one tray of a conveyer belt to another tray of a different conveyer belt. Moving one bolt at a time. TENZ has asked ABC for demonstration the robotic arm for the said purpose as a proof of concept. This is the first project being executed by ABC.  TENZ would like to have a first experience of the robotic arm before signing the MOU (Memorandum of Understanding)with ABC. After MOU sign-off, TENZwould provide the complete set of requirement of the robot. | | |
| **Problem Description** | Identify the most appropriate SDLC model for this scenario. | | |
| **Estimated time :** | **30 minutes** | | |
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| **Experiment 4 (Requirement Development)** | | | |
| **Objective** | To identify the various requirement development activities viz. elicitation, analysis, specification and verification for the given scenarios. | | |
| **Background** | Requirement engineering produces a specification of what a system should do. The intention of requirement engineering is to provide a clear definition of requirement of the systems. This phase is avery important phase because, if the customer requirements are not clearly understood, the ambiguity can get into the other phase of the development. To avoid such issues, requirement has to be elicited using the right elicitation techniques, to be analyzed effectively, specified clearly and verified thoroughly.  All activities are collectively termed as requirement development activities. | | |
| **Problem Description** | Identify the requirement development activities associated with each of the following scenarios, | | |
|  | | 1. Joe is creating an online survey questionnaire for requesting user feedback on the desired features of the application to be developed. 2. Mark is preparing a formal document which includes all of the desired features identified by the survey. 3. Jack identified an incomplete requirement statement. 4. Jones is identifying all security related requirement and separating them from the performance related requirements. 5. Merlin a team member is sent to client to observe the business case and collect typical user requirements. 6. Leo is team member is working on requirement and ensuring that requirement collected should not be vague and unclear. 7. Lee is conducting a facilitated meeting with the stakeholder to capture the requirements. 8. Amit a team member is distributing questionnaires to stack holder for gathering user requirements.  |  |  | | --- | --- | | **Scenario** | **Requirement Development Activities** | | a |  | | b |  | | c |  | | d |  | | e |  | | f |  | | g |  | | h |  | | |
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| **Estimated time:** | | **60 minutes** | |
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| **Experiment 5 (Requirement Elicitation)** | | | |
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| **Objective** | | To identify the various elicitation techniques and their usage for the Banking case study. | |
| **Background** | | Requirement elicitation is the process of seeking, discovering, acquiring and elaborating requirement. This includes learning and understanding the needs of the users. This activity is communication centric and iterative in the nature. The techniques used here are the important to get stack holder consensuson the requirements. | |
| **Problem Description** | | KHL is a leading global bank that provides standard bankingservices to its customers spanning across the globe. The head office is located inLondon and the bank has presence in more than 20 countries with client base of nearly500,000.Tuning with times and ever increasing clients and transactions, the bank hasspecialized branches for specific customer segments like consumer, corporate and theSME’s. KHL Bank aims to be one stop shop for its customers to address their changingfinancial needs. KHL bank offers various banking products and services across itscustomer segments including Core Banking and Wealth Management amongst otherservices.  KHL Bank is well known among its clients for world-class processes and speed ofexecution of transactions as part of core banking. Currently, KHL bank has made aproposal for investing around $200 million in setting-up 24x7 banking support facilitiesfor the customers. The bank has decided to leverage IT for automating several of thebusiness processes including:   * Managing Accounts * Transaction Management   The aim of this proposed banking system is to create a paperless bank there by movingtowards e-banking.FinSoft, a newly established software company has the vision of providing softwaresolutions in the financial sector. Managing Director (MD) of KHL bank has approachedFinSoft for the computerization of the bank so that there is no more manual way ofdoing transactions in any of its branches. As part of automation, the KHL bank users areto be provided with ATM facility, e-banking facility over internet and phone bankingfacility over land lines and cellular networks. FinSoft is doing such a project for the first  Time. Requirements development team in FinSoft has planned for carrying out therequirement elicitation for this project.  In the context of the case study, for the following scenarios identify the most appropriaterequirements elicitation techniques (Brainstorming, Workshops, Questionnaire, TaskAnalysis, Observation, Prototyping, Scenario identification).   |  |  | | --- | --- | | **Scenario** | **Requirement elicitation technique** | | Interrogative conservation with Managers, Cashiers, Clerks and other Staff for arriving at the requirement for automating transactions. |  | | Formal and planned requirement discussion in a conference to room conducted among managers of diversified branched facilitate by anchor. |  | | Survey form circulated among the users(account holders) who visit the bank, to ease their interactions with bank |  | | Analysis for understanding mode of transactions- Checks, Cash, DD, MT, Gold, etc. |  | | Ethnographers deployed for understanding the users interactions with bank officials. |  | | UI design of e-banking portal, ATM,Computer Systems |  | | Understanding the process involved in each transaction like withdraw, deposit, fund transfer etc. |  | | |
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| **Estimated time:** | | **60 minutes** | |
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| **Experiment 6 (Requirement Classification)** | | | |
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| **Objective** | | To Classify the requirement into functional and non-functional requirements. | |
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| **Background** | | Functional requirements (FRs) specify the software functionality that the developer must build into the product to enable users accomplish their tasks, thereby satisfying the business requirements. Non functional requirement as the name suggest, are those requirements which are not directly concerned with the specific functions delivered by the system. Many non-functional requirements (NFRs) related to the system as a whole rather than to individual functional requirements. While failure to meet an individual functional may degrade the system, failure to meet a non-functional system requirement may make whole system unusable. NFR’s are of different types namely usability requirements, reliability requirements etc. | |
| **Problem Description** | | Classify the following requirement by selecting the appropriate option. | |
|  | | 1. ATM machine shall validate PIN of the user during login along with bio-metric verification. 2. “Peak transaction Volume(s)- 20,000 calls in a busy hour, average duration 20 Secs, grade of services 99.98%” 3. “Brahe System Shall sounds the alarm for 10 seconds at frequency of 100H when the brake is applied”. 4. “Mean Time to failure (MTTF)-There should be no more than three Severity-1 outage per month”. | |
| **Estimated time:** | | **30 minutes** | |
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| **Experiment 7 (Requirements)** | | | |
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| **Objective** | | Identify the elements in software Requirements Specification document. | |
| **Background** | | The output of requirement analysis place is the Software requirements Specification it should specify what a system should do. Atypical SRS usually consists of the system overview (both current and proposed). Objectives of the proposed system such that it is proven to be significant development over the existing system, business analysis of the client functional and non-functional requirement, glossary, etc. | |
| **Problem Description** | | Article Systems (AS), a giant books franchise has approached IT company ABCLtd. To help them automate their business processes and shift them online so all of its outlets across the globe would be under one portal. AMC Ltd. , agrees to take on the project and both the companies sit down and strike a deal.  After detailed discussion and analysis, ABC Ltd. decides to follows the waterfall model for development of the project. This discussion covered topics such as the business analysis and operations of AS, The expectations of the client (AS) from ABC Ltd, their needs and requirements from the software, their current existing system including its limitations and what the proposed system would do to address these issues. Taking into account all the input, the concerned team at ABC designed and developed the SRS.  Which of the following are typically expected to be found in the SRS created by ABC Ltd. Towards the AS Project?   |  |  | | --- | --- | | System Overview |  | | Class Diagram |  | | source Code |  | | Use Cases |  | | Flow Charts for algorithms realizing the functionality of the system |  | | Code review Comments |  | | test results |  | | The Difference in the scope of the current system to be proposed system. |  | | Non-Functional requirements |  | | Features of new portal to be developed |  | | |
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| **Estimated time:** | | **60 minutes** | |
| **Experiment 8 (Requirement Verification)** | | | |
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| **Objective** | | To verify the requirements against the quality attributes. | |
| **Background** | | Software requirements specification formally captures the requirements of the software to be developed. Hence it is important that requirements are free from defects like incorrect or conflicting requirements. | |
| **Problem Description** | | Identify the requirements in the given SRS(Premium University Placement Portal) for following issues,   1. Incorrect requirements 2. Ambiguous requirements 3. Missing requirements 4. Conflicting requirements 5. Incomplete requirements | |
| **Estimated time:** | | **60 minutes** | |
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| **Experiment 9 (Software Design)** | | | |
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| **Objective** | | Identify the elements and relationship by analyzing the class diagram of Easy Shop Retail Application case study. | |
| **Background** | | Software Design describes how software is decomposed and organized  into components and the interfaces between those components. It also describes thecomponents at a level of detail that enable their construction. | |
| **Problem Description** | | 1. Study the class diagram of Easy shop retail application depicted in the   “CCFP4.0-SE Easy Shop Manager-Phase1-ClassDiagram.docx” and identify theFollowing for the class “Customer”.   1. Class Name 2. Private attributes 3. Public attributes 4. Private methods 5. Public Methods | |
|  | | 1. In above document, identify the relationship between the elements given below:  |  |  |  | | --- | --- | --- | | **Class 1** | **Class 2** | **Relationship** | | Item | Apparels |  | | Retail Outlet | Item |  | | Customer | Regular Customer |  | | Customer | Address |  | | PurchaseBill | LineItem |  | | Tax | PurchaseBill |  | | |
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| **Estimated time:** | | **60 minutes** | |
| **Experiment 10 (Software Design Principles)** | | | |
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| **Objective** | | Identify the design principle that is being violated in relation to the given  scenario. | |
| **Background** | | A good object oriented design not only meets the specified requirements  but also addresses implicit requirements. There are five design principles which addressmost of the implicit requirements: | |
| **Software Design Principles** | | 1. Abstraction: Focus on solving a problem by considering the relevant details andignoring the irrelevant  2. Encapsulation: Wrapping the internal details, thereby making these details  inaccessible.Encapsulation separates interface and implementation, specifyingonly the public interface to the clients, hiding the details of implementation.  3. Decomposition and Modularization: Dividing the problem into smaller,  independent, interactive subtasks for placing different functionalities in differentcomponents  4.Coupling& Cohesion: Coupling is the degree to which modules are dependenton each other. Cohesion is the degree to which a module has a single, welldefined task or responsibility. A good design is one with loose coupling andstrong cohesion.  5. Sufficiency, Completeness and Primitiveness: Design should ensure the  completeness and sufficiency with respect to the given specifications in a verysimple way as possible. | |
| **Problem Description** | | Which of the following design principle(s) have been violated in the following scenarios?  1.Abstraction  2.Decomposition and Modularization  3.Coupling & Cohesion  4.Encapsulation  5.Sufficiency, Completeness and Primitiveness  6.All   |  |  |  | | --- | --- | --- | | **No.** | **Description** | **Principle Being Violated** | | 1 | Important information of a module is directly accessible by othermodules |  | | 2 | Too many global variables in the program after implementing thedesign |  | | 3 | Code breaks in unexpected places |  | | 4 | Unfulfilled requirements in the code after the design has been implemented |  | | 5 | Cyclic dependency among classes |  | | 6 | Huge class doing too many unrelated operations |  | | 7 | Several un-related functionalities/tasks are carried out by a singlemodule |  | | 8 | All data of all classes in public |  | | 9 | Design resulting in spaghetti code |  | | 10 | An algorithm documented as part of design is not understandable by the programmers |  | | |
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| **Estimated time:** | | **60 minutes** | |
| **Experiment 11 (Integration Testing)** | | | |
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| **Objective** | | To identify the usage of stubs or drivers in the context of an integration  testing scenario. | |
| **Background** | | Integration testing is carried out after the completion of unit testing and  before the software is delivered for system testing. In top down integration testing,dummy stubs are required for bottom level modules. Similarly in bottom up testing,dummy drivers are required for top level modules. | |
| **Problem Description** | | Consider the scenario of development of software for Travel,  Management System (TMS) is in progress. The TMS software has 3 major modulesnamely Ticket\_Booking\_Module, Hotel\_Booking\_Module and Taxi\_Booking\_Module.The Ticket\_Booking\_Module has 3 sub modules namely Enquiry\_Module,Booking\_Module andUpdate\_Module. The enquiry module uses Date\_Validation\_Unit,Ticket\_Validation\_Unitand Place\_Validation\_Unit.  C:\Users\user\Desktop\nidhi.jpg  In the context of the given scenario, identify the usage of stub or driver for the followingsituations.  1. Except the Ticket\_validation\_Unit, the coding and unit testing of all other  modules, sub modules and units of TMS are completed. The top-down  integration is in progress for the TMS software. To carry out the integration  testing, which among the following is necessary?   * A Stub for Ticket\_Validation\_Unit * A Driver For Ticket\_Validation\_Unit * A Stub for Enquiry\_Module * A Driver for Enquiry\_Module * A Stub For Ticket\_Booking\_Module * A Driver For Ticket\_Booking\_Module   2. The coding and unit testing of all the module, sub modules and units of TMS arecompleted except the Update\_Module (coding and testing for Edit\_Module,  Cancel\_Module and View\_Module are also completed).  The bottom-upintegration is to be started for the TMS software. Mention any stub or driverneeded to carry out the integration testing?   1. Except the Taxi\_Booking\_Module, the coding and unit testing of all other modules, sub modules and units of TMS are completed. The top-down integration is to be started for the TMS software. Mention any stub or driver needed to carry out the integration testing? | |
| **Estimated time:** | | **60 minutes** | |
| **Experiment 12 (Performance Testing)** | | | |
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| **Objective** | | Identify the different types of performance testing | |
| **Background** | | Performance testing tests the non-functional requirements of the system.  The different types of performance testing are load testing, stress testing, endurancetesting and spike testing. | |
| **Problem Description** | | Identify the type of performance testing for the following:  1. A space craft is expected to function for nearly 8 years in space. The orbit controlsystem of the spacecraft is a real-time embedded system. Before the launch, theembedded software is to be tested to ensure that it is capable of working for 8years in the space. Identify the suitable performance testing category to becarried out to ensure that the space craft will be functioning for 8 years in thespace as required.  2. Global Education Centre (GEC) at Infosys Mysore provides the training for freshentrants. GEC uses an automated tool for conducting objective type test for thetrainees. At a time, a maximum of 2000 trainees are expected to take the test.Before the tool is deployed, testing of the tool was carried out to ensure that it iscapable of supporting 2000 simultaneous users. Indicate the performance testingcategory?   1. A university uses its web based portal for publishing the results of the students. When the results of an examination were announced on the website recently on a pre-planned date, the web site crashed. Which type of performance testing should have been done during web-site development to avoid this unpleasant situation?   4. During unexpected terrorist attack, one of the popular websites crashed as manypeople logged into the web-site in a short span of time to know the  consequences of terrorist attack and for immediate guidelines from the securitypersonnel. After analyzing the situation, the maintenance team ofthat websitecame to know that it was the consequences of unexpected load on the systemwhich had never happened previously. Which type of performance testing shouldhave been done during web-site development to avoid this unpleasant situation?   |  |  | | --- | --- | | **Scenarios** | **Performance Testing Type** | | Scenario 1 |  | | Scenario 2 |  | | Scenario 3 |  | | Scenario 4 |  | | |
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| **Estimated time:** | | **60 minutes** | |
| **Experiment 13 (RegressionTesting)** | | | |
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| **Objective** | | To identify the usage of regression testing. | |
| **Background** | | Enhancements are introduction of new features to the software and might  be released in different versions. Whenever a version is released, regression testingshould be done on the system to ensure that the existing features have not beendisturbed. | |
| **Problem Description** | | Consider the scenario of development of software for Travel  Management System (TMS) discussed in previous assignment. TMS has been  developed by Infosys and released to its customer Advance Travel Solutions Ltd.(ATSL).Integration testing, system testing and acceptance testing were carried out beforereleasing the final build to the customer. However, as per the customer feedback duringthe first month of usage of the software, some minor changes are required in theEnquiry Module of the TMS. The customer has approached Infosys with the minorchanges for upgrading the software. The development team of Infosys has incorporated. Those changes, and delivered the software to testing team to test the upgradedsoftware.  Which among the following statement is true?   1. Since minor changes are there, integration of the Enquiry Module and quick   system testing on Enquiry module should be done.   1. The incorporation of minor changes would have introduced new bugs into othermodules, so regression testing should be carried out. 2. Since the acceptance testing is already carried out, it is enough if the team   performs sanity testing on the Enquire module.   1. No need of testing any module. | |
| **Estimated time:** | | **30 minutes** | |
| **Experiment 14 (Defect Classification)** | | | |
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| **Objective** | | To classify the given defects into different defect types. | |
| **Background** | | Defect detection activities like reviews and testing help in identifying the  defects in the artifacts (deliverables). These defects must be classified into variousbuckets before carrying out the root cause analysis. Following are some the defectCategories.   1. Logical 2. User interface 3. Maintainability 4. Standards | |
| **Problem Description** | | In the context of the above defect categories, classify thefollowing statements under the defect categories and mention in the table given below.  1. Divide by Zero Error is not guarded  2. Usage of 3.14 in the statement Circle\_Area = 3.14 \* Radius \* Radius;  3. 3500 lines of code in a single function  4. A pointer is declared but not initialized. It is used in the program for storing a value.  5. A program designed to handle 1000 simultaneous users, crashed when 1001 the userlogged in.  6. A “while” loop never exits  7. User interface displays “MALFUNCTION 54” when something goes wrong in theback-end  8. No documentation (comments) for the source code  9. Hungarian Notation not followed while coding, even though the coding guidelinesmandate to use Hungarian Notation  10. Pressing of “Tab” key moves the cursor in different fields of a web form randomly.   |  |  |  | | --- | --- | --- | | **Statement** | **Defect Category** | **Defect Name** | | 1 |  |  | | 2 |  |  | | 3 |  |  | | 4 |  |  | | 5 |  |  | | 6 |  |  | | 7 |  |  | | 8 |  |  | | 9 |  |  | | 10 |  |  | | |
| **Estimated time:** | | **60 minutes** | |
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| **Experiment 15 (Software Metrics)** | | | |
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| **Objective** | | To understand usage of software metrics. | |
| **Background** | | There are some metrics which are fundamental and the rest can bederived from these. Examples of basic (fundamental) measures are Size, Effort, Defect,Schedule. If the fundamental measures are known, then we can derive others. Forexample if size and effort are known, we can get Productivity (=size/effort). If the totalnumbers of defects are known we can get the Quality (=defect/size) and so on. | |
| **Problem Description** | | Online loan system has two modules for the two basic services,namely Car loan service and House loan service.  The two modules have been namedas Car\_Loan\_Module and House\_Loan\_Module.Car\_Loan\_Module has 2000 lines of uncommented source code. House\_Loan\_Modulehas 3000 lines of uncommented source code.Car\_Loan\_Module was completely implemented by Mike. House\_Loan\_Module wascompletely implemented by John.Mike took 100 person hours to implement Car\_Loan\_Module. John took 200 personhours to implement House\_Loan\_Module.Mike’s module had 5 defects. John’s module had 6 defects.With respect to the context given, which among the following is an INCORRECTstatement?  Choose one:   1. John’s Quality is better than Mike’s Quality 2. John’s Productivity is more than Mike’s Productivity 3. John introduced more defects than Mike 4. John’s Effort is more than Mike’s Effort | |
| **Estimated time:** | | **60 minutes** | |
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|  | | **PART-II** | |
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|  | | **Project Work** | |
| **Objective** | | Understand Importance of SDLC approach & various processes . | |
| **Problem Description** | | Software Develpoment Life cycle involve multiple phases like Requirment analysis,Design, Coding, Testing & Maintenance.  In each phase certain activities are performed to deliver the deliverables or outcome eg. from Requirment Analysis pahse outcome is SRS document which is input to the Design phase.  Project group is assineged with a project and asked to perform the complete cycle of SDLC. Following are some instruction related to the project work,   * 1. Project group has to collect the required information related to the assigned system/project.   2. Project group has to develop the project and deliever the deliverables on the timelines given by the Teached/Lab Instructor.   3. On the completion of duartion, each project group has to submit a project report. The Teacher/Lab Instructor will evalute the report.   4. The Implementation of project will be done on C langagaue. | |
| **Estimated time :** | | **15-30 hours** | |
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