Class: B.Tech(IT)
Date: *1st December 2023*

Time: 180 minutes
Marks: 50 Marks

Register No.

| 2 | 1 | 1 | 0 | 5 | 0 | 1 | |

Make necessary assumptions, and clearly mention these assumptions in the answer script. Please do not ask any clarifications to the invigilators. Write legibly otherwise that answer will not be evaluated

1. **Case Study Title: E-Toll System**

   Description: Traffic congestion at Toll Plazas is creating huge economical loss in terms of fuel wastage apart from adding to environmental pollution. An application may be developed to have QR equipped Payment Receipt for long distance vehicles which can be scanned at the QR readers installed at unmanned toll lanes for passing through the toll gates.

   For the above case study
   a) Identify Business use cases and Non functional requirements and how to model NFR (5 marks)
   b) Illustrate the use cases using communication diagrams 5 marks
   c) Illustrate the use cases using Activity diagrams 5 Marks
   d) Identify system actors, specialized actors (if any), use case relationships 5 Marks
   e) Preconditions Post conditions of Use case 5 Marks
   f) Explain Static and Dynamic Analysis with respect to the case study? 10 Marks

2. Explain with the help of a case study and code snippet the following patterns
   a) Singleton (Thread safe implementation with comparison of lazy initialization and eager initialization) 5 Marks
   b) Decorator 5 Marks
   c) Adaptor 5 Marks
   d) Builder 5 Marks

   ****

Class: B.Tech(IT)

Date: 30th September 2023

Time: 90 minutes

Marks: 25 Marks

Register No. | 2 | 1 | 1 | 0 | 5 | 0 | 1 | |

Make necessary assumptions, and clearly mention these assumptions in the answer script. Please do not ask any clarifications to the invigilators.

1. Compare 5 architectural styles based on any 5 quality attributes. Give a tabular comparison along with a detailed explanation of why one architectural style is better than the other for the said quality attribute? **8 Marks**

2. Explain the difference between the system use case and business use case based on the following case study of Library management systems **8 Marks**

   Case Study

   Library management systems help libraries keep track of their documents inventory and loans, and member subscriptions and profiles, sometimes for multiple physical locations. Libraries rely on library management systems to manage asset collections as well as relationships with their members. This type of software solution can be used by educational institutions' libraries, as well as public or private libraries. Library patrons use library management systems to find, reserve, and loan documents while library staffs employ it to manage the acquisition, cataloging, and inventory of documents.

3. Consider a fluid level controller system used to maintain the fluid level in a tank at a constant value. The system is composed of four components (or blocks): a level sensor S, control logic L, a group motor/pump P, and a valve V. The components are connected in series. In order to compute the reliability of the system we need to know the reliability of its components, the components have exponential failure time distribution. Consulting a data bank, the following values were obtained (expressed in failures per hour or f hr−1):

   a. S = Level sensor $\lambda s = 2 \times 10{-6}$ fhr -1 ,
   b. L = Control logic $\lambda L = 5 \times 10{-6}$ fhr -1 ,
   c. P = Group motor/pump $\lambda P = 2 \times 10{-5}$ fhr -1 ,
   d. V = Valve $\lambda V = 1 \times 10{-5}$ fhr -1

   Find out the reliability R(t), unreliability F(t) and mean time to failure (MTTF) for the complete system for a time period of t= 8760 hr.   **4 Marks**

4. Discuss the Markov model with state transition diagram for a 2-component parallel system, Where the components are non-repairable. Assume λ_A --- Component A failure rate and λ_B --- Component B failure rate. Derive the state Equations for every state. Convert the same (2-component parallel system) to a Petri-Net model with detailed Explanation? **5 Marks**

****