Gemini

P1: Analyze the system description for ambiguities, incompleteness, and contradictions

- Unstructured
    - Validity: 1-0/6 = 1
    - Completeness: Missing all 1-6/6 = 0
    - Consistency: "Data Privacy" and "Error Handling" are not explicitly mentioned. 1-2/6 = 0.666
- Structured
    - Validity: 1-0/8 =1
    - Completeness: Missing 2 contradictions. 1-2/6 = 0.666
    - Consistency: "Data Privacy" and "Error Handling" are not explicitly mentioned. 1-2/8 = 0.75

P2: Identify and categorize the functional and non-functional requirements of the system description

- Unstructured
  - Validity: User Interface not an FR. 1-1/(4+7) = 0.909
  - Completeness: 1-0/6 = 1
  - Consistency: "Privacy" "Security" "Performance" not explicitly mentioned. 1-3/11 = 0.727
- Structured
  - Validity: "Support multiple control interfaces" not an FR. 1-1/(8+10) = 0.944
  - Completeness: 1-0/6 = 1
  - Consistency: "Data Privacy and Security" "Error Handling and Recovery"" Performance" not explicitly mentioned. 1-3/18 = 0.833

P3: Create a use case model for the smart home system

- Unstructured
    - Validity: No system boundary (-0.1). No separation of primary & supporting actors (-0.1). "Mobile App" is identified as an actor, but use cases show that it is the system. Invalid actor in UC5. $1-(1*0.1)/5 -0.1-0.1 = 0.78$
    - Completeness: Missing "Automation", "Integrate Entity". $1-2/3 = 0.333$
    - Consistency: "Schedule Appliance" and "Receive Sensor Alert" not explicitly identified. $1-2/5 = 0.6$
- Structured
    - Validity: Clear system boundary. Separation of primary & supporting actors. $1-0/5 = 1$
    - Completeness: $1-0/3 = 1$
    - Consistency: "Monitor System Status" and "Receive Alerts and Notification" not explicitly defined. $1-2/5 = 0.6$

P4: Create use case specifications for every use case

- Unstructured
  - Validity: 2/5 UCs developed - Turn on Lights, Adjust Thermostat. Alternative flows. No reference to basic flow in alternative flows. (-0.1). 1-(3+2*0.1)/5 = 0.36
  - Completeness: Missing automation & integration. 1-2/3 = 0.333
  - Consistency: Missing 3 use cases but mentioned. 1-3/5 = 0.4
- Structured
  - Validity: 1-0/5 = 1
  - Completeness: 1-0/3 = 1
  - Consistency: 1-0/5 = 1

P5: Identify domain concepts and their relationships from the created use case specifications.

- Unstructured
  - Validity: 5/9 having no multiplicities (-0.1). $1-(5*0.1)/(7+9) = 0.968$
  - Completeness: Missing Interface, SmartHomeEcosystem, VoiceAssistant, $1-3/7 = 0.571$
  - Consistency: Automation Rule not explicitly described in use cases. $1-1/7 = 0.857$

- Structured
  - Validity: $1-0/(5+5) = 1$
  - Completeness: $1-0/6 = 1$
  - Consistency: $1-0/5 = 1$

P6. Identify system operations from use case specifications of the smart home system.

- Unstructured
  - Validity: Descriptive operations with no parameters (-0.1). 2/16 (7-1,7-2) not actor-initiated operations. $1-(2+14*0.1)/16 = 0.787$
  - Completeness: Missing integration. $1-1/3 = 0.666$
  - Consistency: 14/16 system operations not explicitly mentioned in UCs. Missing view lights, get settings from the two UCs. $1-(14+2)/(16+2) = 0.111$
- Structured
  - Validity: Clear operations with parameters. $1-0/14 = 1$
  - Completeness: $1- 0/3 = 1$
  - Consistency: $1-0/14 = 1$

P7: Create design sequence diagrams for system operations of the smart home system.

- Unstructured
  - Validity: No clear operations defined. (-0.1) $1-(2*0.1)/2 = 0.9$
  - Completeness: Missing automation, integration. $1-2/3 = 0.333$
  - Consistency: Missing 14/16 system operations. $1-14/16 = 0.125$
- Structured
  - Validity: 5 SD defined - GetDeviceStatus, CreateAutomationRule, IntegrateExternalSystemDevice, GetDeviceDetails, SendNotification. It selected 5 key operations. Inconsistent participants in all SDs. (-0.1) $1-(5*0.1)/5 = 0.9$
  - Completeness: Missing control command. $1-1/3 = 0.666$
  - Consistency: Missing 9 system operations. $1-5/14 = 0.642$

P8: Create design class diagrams based on the domain model and sequence diagrams of the smart home system.

- Unstructured
  - Validity: 7 classes defined - Home, Resident, Device, AutomationRule, Appliance, Sensor, Command. Missing data types (-0.1). Missing navigability (-0.1) on all 6 associations. Visibility defined. 1-(7*0.1+6*0.1)/(7+6) = 0.9
  - Completeness: Missing Interface, Ecosystem, VoiceAssistant. 1-3/6 = 0.5
  - Consistency: All 7 MDC classes defined. Inconsistent operations in all 2 SDs with DCD - Turn on Light, Receive Sensor Alert. Mobile App, Smart Home Hub, Light Device, Motion Sensor Device in SD not defined (4 classes). 1- (2+2+4)/(7+2+4) = 0.384

- Structured
  - Validity: Missing navigability for 7/13 associations (-0.1). No visibility. 1- (7*0.1)/(14+13) = 0.974
  - Completeness: VoiceAssistant&Ecosystem generated into ExternalSystem. 1-(2*0.5)/6 = 0.833
  - Consistency: 14 classes defined - Homeowner, SmartHomeSystem, Device, AutomationRule, Trigger, TimeTrigger, LocationTrigger, SensorTrigger, Action, TurnOnAction, TurnOffAction, SetSettingAction, Notification, ExternalSystem. Notification Manager in SendNotification SD not defined (1 SD). Inconsistent operations in 4/5 DSDs - GetDeviceStatus (name mismatch), CreateAutomationRule (undefined), IntegrateExternalSystemDevice (undefined), GetDeviceDetails (undefiled). 1-5/(14+5)= 0.736

P9. Develop a Java implementation for the system as specified in the class diagram and sequence diagrams.

- Unstructured
  - Validity: Missing or incomplete operations in 5 classes (-0.7). No driver. $1-(0.7*5+1)/(7+1) = 0.437$
  - Completeness: Smart Home System is not the interface class, but a collection of homes. Missing Interface, Trigger, Ecosystem, VoiceAssistant. $1-4/6 = 0.333$
  - Consistency: Smart Home System, Home, Resident, Device, Light, Sensor, Command implemented (7 classes). Smart Home System and Light are newly implemented (2 classes). Missing AutomationRule, Appliance in CD (2 classes). No DSDs implemented (2 DSDs). $1-(2+2)/(7+2+2) = 0.636$

- Structured
  - Validity: Mostly getters and setters except login() in Homeowner, createAutomationRule() in SmartHomeSystem, execute() in TurnOnAction, TurnOffAction, evaluate() in AutomationRule. Missing or incomplete operations in Homeowner, SmartHomeSystem, Device, TimeTrigger, LocationTrigger, SensorTrigger, SetSettingAction, Notification, ExternalSystem (9 classes). Driver implemented. $1-(9*0.7)/14 = 0.55$
  - Completeness: VoiceAssistant&Ecosystem generated into ExternalSystem. $1-(2*0.5)/6 = 0.833$
  - Consistency: Homeowner, SmartHomeSystem, Device, Trigger, TimeTrigger, LocationTrigger, SensorTrigger, Action, TurnOnAction, TurnOffAction, SetSettingAction, AutomationRule, Notification, ExternalSystem, SmartHomeSystemDriver implemented (14 classes). Missing 2/5 DSDs – IntegrateExternalSystemDevice, SendNotification. $1-2/(14+5) =0.894$

Prompt 10:Develop tests including unit tests, integration tests, and system tests for the implementation of the smart home system.

- Unstructured
  - Validity: No declaration (-0.1). No test code (-0.6). $1-(0.1*9+0.6*9)/9 = 0.3$
  - Completeness: Missing 4 classes – Interface, Trigger, Ecosystem, VoiceAssistant. Missing automation, integration. $1-(4+2)/(6+3) = 0.333$
  - Consistency: Missing "SmartHomeSystem", "Home", and "Command". $1-3/(9+3) = 0.75$

- Structured
  - Validity: No declaration (-0.1). No test code (-0.6). $1- (0.1*11+0.6*11)/11 = 0.3$
  - Completeness: VoiceAssistant&Ecosystem generated into ExternalSystem. $1-(2*0.5)/6 = 0.833$
  - Consistency: Missing AutomationRule and Notification. $1-2/(11+2) = 0.846$