**Birla Institute of Technology & Science, Pilani**

**Work-Integrated Learning Programmes Division**

**Second Semester 2020-2021**

**Mid-Semester Test**

**(EC-2 Regular)**

Course No. : SS ZG653

Course Title : SOFTWARE ARCHITECTURES

Nature of Exam : Open Book

No. of Pages = 3

# No. of Questions = 7

Weightage : 30%

Duration : 2 Hours

Date of Exam : Saturday, 06/03/2021 (FN)

Note:

1. Please follow all the *Instructions to Candidates* given on the cover page of the answer book.
2. All parts of a question should be answered consecutively. Each answer should start from a fresh page.
3. Assumptions made if any, should be stated clearly at the beginning of your answer.
4. The Pipes and Filters pattern is primarily used for sequential actions such as processing data streams or incremental processing. It is also used in applications that require high availability. You have been asked to implement relevant tactics to improve the **availability** quality attribute of the Pipes and Filter pattern.
5. Suggest a comprehensive end-to-end solution (with specific implementation details). The solution should include all steps from defect identification to assuring high availability.
6. Explain how the solution meets the availability requirements with an example scenario [8]
   1. The Pipes and Filters pattern is primarily used for sequential actions such as processing data streams or incremental processing. It enables flexibility. You have been asked to implement relevant tactics to improve the **performance** quality attribute of the Pipes and Filter pattern.
7. Suggest a comprehensive end-to-end solution (with specific implementation details)
8. Explain how the solution meets the performance requirements with an example scenario. The scenario should include the behaviors of the system before and after the implementation of tactics. [8]
   1. The Pipes and Filters pattern is primarily used for sequential actions such as processing data streams or incremental processing. It enables performance and flexibility. It is also used in applications that require high scalability. You have been asked to implement relevant tactics to improve the **scalability** quality attribute of the Pipes and Filter pattern.
9. Suggest a comprehensive end-to-end solution (with specific implementation details)
10. Explain how the solution meets the scalability requirements with an example scenario. The scenario should include the behaviors of the system before and after the implementation of tactics. [8]
11. In a certain Metro Railway station, the ticket machines accept cash but do not give change. There is a separate machine that dispenses change but does not sell tickets.
12. Which quality attribute(s) is (are) being addressed by this design / deployment strategy?
13. what is (are) the tactic(s) being used?
14. Explain / Justify your answer [3]
15. In an average Metro Railway Station there are six or eight ticket machines for every change machine (higher denominations to lower denominations).
16. Which quality attribute(s) is (are) being addressed by this design / deployment strategy?
17. what is (are) the tactic(s) being used?
18. Explain / Justify your answer [3]
    1. In a busy store there are many billing counters. On seeing the Q, the manager decides to open additional billing counters
19. Which quality attribute(s) is (are) being addressed by this strategy
20. what is (are) the tactic(s) being used?
21. Explain / Justify your answer [3]
    1. An autonomous car is a vehicle capable of sensing its environment and operating without human involvement. Various sensors collect data about the environment. Sophisticated software then processes all this sensory input, plots a path, and sends instructions to the car’s actuators, which control acceleration, braking, and steering
22. Choose the most appropriate architectural pattern for above application
23. Explain / Justify your answer. [4]
    1. A 3rd party analytics company has been commissioned to collate the Covid Infection data across the country. They will provide statistics, analysis, trending. The data itself is generated by individual entities in the field that are managing the situation
24. Choose the most appropriate architectural pattern for above application.
25. Explain / Justify your answer. [4]
    1. Aadhaar authentication is the process wherein Aadhaar Number, along with other attributes, including biometrics, are submitted online to the Aadhar Authority for its verification on the basis of information or data or documents available with it. This can be used by various agencies like banks to verify the identity of Aadhaar holders
26. Choose the most appropriate architectural pattern for above application.
27. Explain / Justify your answer. [4]
    1. A Tech Lead while designing a sub-system evolves a very unique data format to exchange data between the components in the sub-system and other sub-systems
28. In the above design decision identify the quality attribute(s) that is being compromised (impacted).
29. Justify your answer [3]
    1. To improve the performance of a system developed in Java and to be hosted in a Linux environment, the architect decides to use native Linux system calls.
30. In the above design decision identify the quality attribute(s) that is being compromised (impacted).
31. Justify your answer [3]
    1. Insider threat Incidents are increasing. To enhance the security an architect introduces a very short session timeout. This forces the users to login even after a very brief periods of inactivity.
32. In the above design decision identify the quality attribute(s) that is being compromised (impacted).
33. Justify your answer [3]
    1. In the context of Quality attributes, the following statement is made Modifiability negatively impacts Performance. Explain the above statement with specific example [3]
    2. In the context of Quality attributes, the following statement is made Interoperability negatively impacts Performance. Explain the above statement with specific example [3]
    3. In the context of Quality attributes, the following statement is made. Availability negatively impacts Performance. Explain the above statement with specific example. [3]

1. As per the Pattern Catalogue one of the weakness of **shared data store** is that **Producers and Consumers of data may be tightly coupled.**
2. Suggest method(s) to augment the above pattern with tactics to reduce the impact of the said weakness
3. Explain / Justify your answer [5]
4. As per the Pattern Catalogue one of the weakness of **shared data store** is that the shared-data store may itself be a **single point of failure**.
5. Suggest method(s) to augment the above pattern with tactics to reduce the impact of the said weakness
6. Explain / Justify your answer [5]
7. As per the Pattern Catalogue one of the weakness of shared **data store** is that the shared-data store may itself be a **performance bottleneck**.
8. Suggest method(s) to augment the above pattern with tactics to reduce the impact of the said weakness
9. Explain / Justify your answer [5]

* 1. In Architecture design the coordination mechanism could be either **synchronous or asynchronous**. With an example Discuss the advantages and disadvantages of each with respect to the **performance response latency** [4]
  2. In Architecture design the coordination mechanism could be either **stateful or stateless**. With an example Discuss the advantages and disadvantages of each with respect to **performance** [4]
  3. In Architecture design the coordination mechanism could be either **synchronous or asynchronous**. With an example Discuss the advantages and disadvantages of each with respect to the **performance response throughput** [4]

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