西 安 电 子 科 技 大 学

考试时间 120 分钟

试　　题

题号	一	二	三	总分
分数				

1. 考试形式：闭卷； 2. 本试卷共 3 大题，满分 100 分。

班级_____学号_____姓名_____任课教师_____

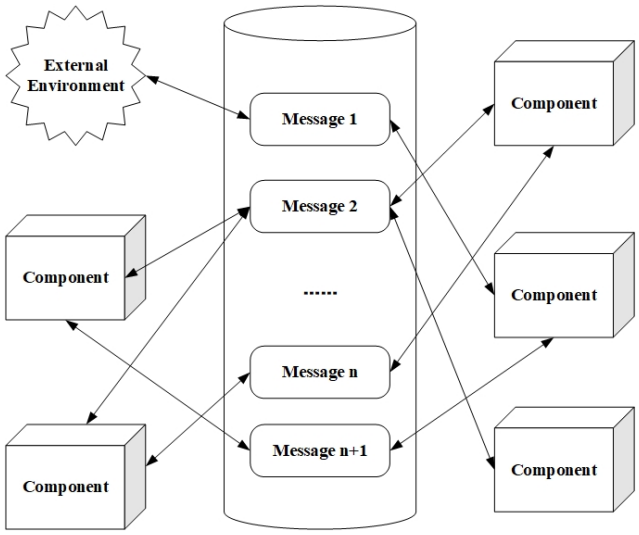
Note: Write all answers on the answer sheet(请将答案写在答题纸上).

Question 1: Explanations (10 points)

1. **According to your understanding, please explain the concept of software architecture evaluation and the necessity of carrying out it.**
2. **Please describe the "virtual machine" or "rule-based system" architecture style and point out its advantages and disadvantages.**

Question 2: Multiple Choice（单项选择）(20 points)

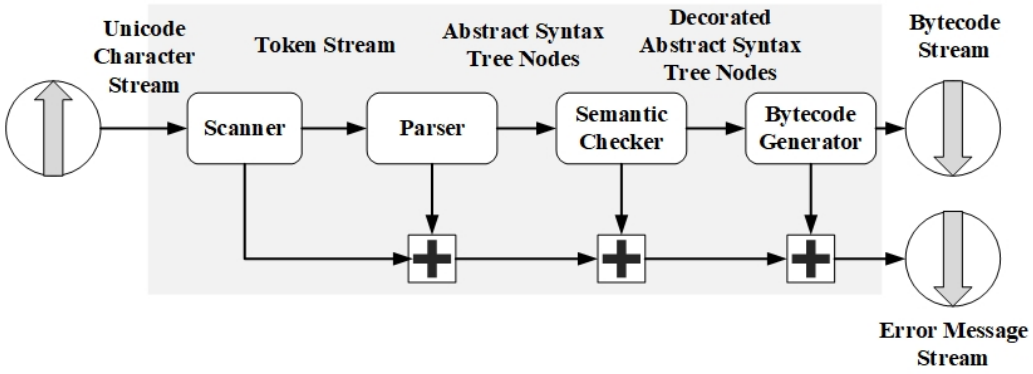
1. Which architecture style does the following diagram describe?



A) Implicit invocation　　B) Independent Components

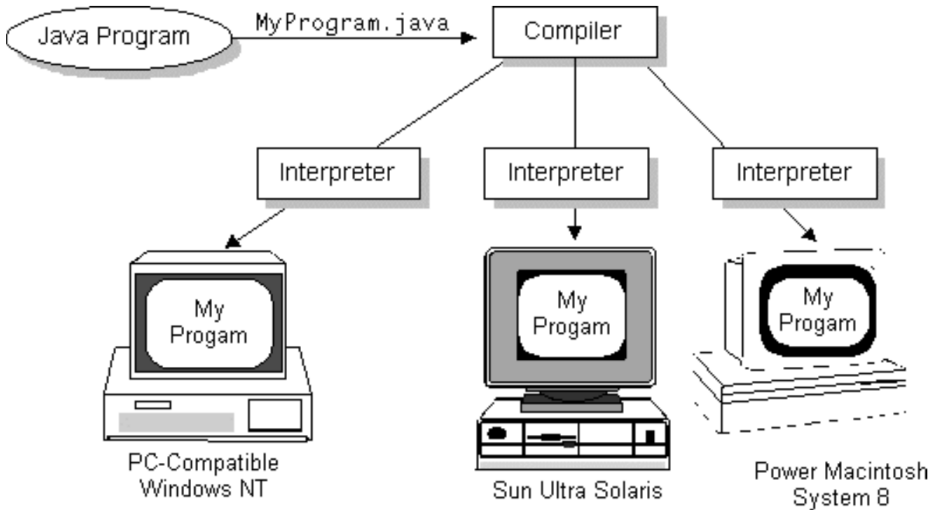
C) Event System **D) Client-Server**

2. Which architecture style does the following diagram describe?



A) Pipes and filters **B) Repository**
C) Data-centered **D) Layered**

3. Which architecture style does the following diagram describe?



A) Object-Oriented **B) Virtual Machine**
C) Communicating Processes **D) Main Program and Subroutine**

4. Which of the following tactic can be used to achieve the Testability?
A) Record/Playback **B) Authorize Users**
C) Generalize Module **D) Shadow**

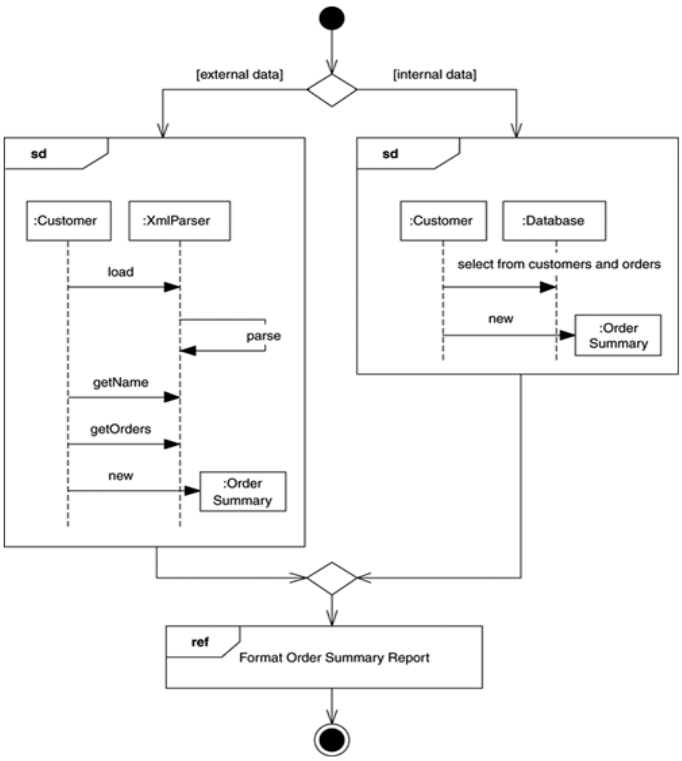
5. Which of the following tactic can be used to achieve the Usability?

A) Maintain Data Confidentiality **B) Use an Intermediary**
C) Manage Event Rate **D) Cancel Undo**

6. Which of the following tactic can be used to achieve the Security?
A) Ping/echo **B) Aggregate**
C) Hide Information **D) Limit Access**

7. Which of the following views is not one of Kruchten's 4+1 views?
A) Process view **B) Execution view**
C) Development view **D) Logical view**

8. Which kind of diagram is the following diagram?



A) Sequence Diagram **B) State Diagram**
C) Interaction overview diagram **D) Activity Diagram**

9. Which kind of diagram is good at describing the interaction and content between multiple objects?
A) Package Diagram **B) Communication Diagram**
C) Object diagram **D) Activity Diagram**

10. Which diagram is suitable to the physical architecture of the

software and hardware in the system?

A) Deployment Diagram **B) Use case diagram**

C) Sequence Diagram **D) Class diagram**

Question 3: Architecture Analysis and Design (70 points)

1. Quality Attribute and Architecture Style (38 points)

Please analyze the requirements and complete following 4 Questions.

A company plans to develop a news sharing system. The system can support users to subscript personal news, according to their interesting news categories or news publishers. When the related news categories or news publishers produced news, the system can send the news to subscribers (users). Users can also cancel previous subscriptions at any time, and they will no longer receive related news after the cancellation of corresponding subscription. The specific requirements of the platform are described as follows:

a) The platform supports users to login by the mobile phone number, the WeChat and the Ailpay.

b) When the user cancel one subscription, the cancellation is required to be completed within 20 seconds.

c) The system can support all users to read news, but only the identified user can comment the news.

d) The project manager insists the system should be tested prior to release, and test cases should be designed to support at least 60% statement coverage during system testing period.

e) When a large number of news publishers (below 100000 publishers) publish new news in the system at the same time, the system's feedback time should be within 30 seconds.

f) The users access interface of the system should include multi-language version, and search association.

g) The system is deployed in cloud servers, and servers will fail during the work process. It should be ensured that the fault location is determined within 20 minutes.

h) In order to quickly locate the fault location, the system should provide system operation logs and specific inspection interfaces.

i) The system should have the ability to continuously expand to

accommodate（接纳） more forms of news, including short videos and audio books. The deployment of new functions can be finished within 1 months, and other original functions cannot be impacted.

j) The system should provide a user guide for new users.

k) When a network failure occurs, the system can ensure uninterrupted operation by switching the backup host.

l) User information and privacy stored on the system should be encrypted, and the level of encryption is high.

Questions:

1) Identify and name the related quality attributes according to the requirements. (12 points)

2) For each quality attribute, give the corresponding quality attribute scenario. (10 points)

3) For each quality attribute, list at least 2 solutions for archiving the corresponding quality attribute. (6 points)

4) According to the requirements, which software architecture style is better for this system? And then, briefly describe the reason for your selection and your architectural design idea. (10 points)

2. Utility Tree (16 points)

A Software development team have analyzed the Quality attributes (QAs), designed architecture and wanted to use Utility Tree to evaluate the architecture of a software system. The following are the QA scenarios.

a) 2/3 of the servers go down during normal operation without affecting overall system's functionality;

b) Add a new data server to reduce latency in scenario 1 to 2.5 seconds within 1 person-week;

c) Credit card transactions are secure 99.999% of the time;

d) Deliver 4k HD video with less than 1 second latency;

e) Change the encryption module in < 3 person-days;

f) Network failure detected and recovered in < 1.5 minutes, and notice operator;

g) All data of users is encrypted with 99.99% of security;

h) Add more database servers to reduce the storage latency on customer database to < 200ms;

i) All operations in the system should be recorded for the further

auditing;

j) **When there is no Internet available, the system will enter the degraded mode and has the minimum functions.**
k) **Add a new service for the system in < 20 person-month;**
l) **A user's nickname must have least 5 characters/numbers starting with a letter.**

Question:
Please according the scenarios, please construct a Utility Tree.

3. Architecture Evaluation (16 points)
It is an important task in architecture evaluation that identify and record risks and non-risks, sensitivity points and tradeoffs. Please read and analyze the following descriptions and answer the Questions.

a) **The message data type and encoding（编码） algorithm could significantly affect the average effort to modify the transport module of the system;**
b) **The average process time of a user's request via the Web during peak period is 2s, and the average network latency is 1s. The system needs to response the user's request in 7s.**
c) **The complexity of encryption algorithms could have a great impact on both security and performance;**
d) **The "transfer money" function is located the second tier of a three-layer C/S architecture, and rules for its business process are not clearly described. This could result in ambiguity（二义性） of functionality during the implementation phase;**
e) **Suppose the message arrival rates are 30 per second, and the average processing time is 300ms. The soft deadline is 1 second;**
f) **The encryption algorithm and the length of the password could have a profound impact on the security.**

Questions:
1) **Describe the definitions of the risk, non-risk, sensitivity point and tradeoff.**
2) **Point out each description is the risk, non-risk, sensitivity point or tradeoff.**