装 订 线

任课教师：

装 订 线

学号：

姓名：

班级： 装 订 线

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☑ 开卷□

2. 考试日期： 年 月 日(答题内容请写在装订线外)

一、简答题（第 1 小题 4 分，第 2 小题 6 分，共 10 分）

1. According to your understanding, please describe what software architecture is.

2. Please describe the “blackboard” architecture style and point out its advantages and disadvantages.

二、单项选择题（每小题 4 分，共 20 分）

1. Which of the following tactic can be used to achieve the <u>security</u>?

(A) Information hiding (B) Implicit invocation

(C) Removal from service (D) Limit exposure

[D]

2. Which of the following tactic can be used to achieve the <u>availability</u>?

(A) Hide information (B) Heartbeat

(C) Scheduling policy (D) Introduce concurrency

[B]

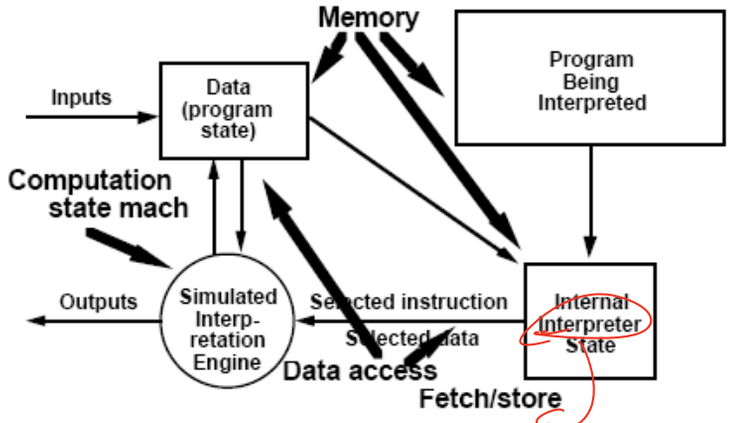
3. Which of the following tactic can be used to achieve the performance?

(A) Prevent ripple effects　　(B) Limit exposure

(C) Manage event rate　　(D) Process communication

[　　]

4. Which architecture style does the following diagram describe?

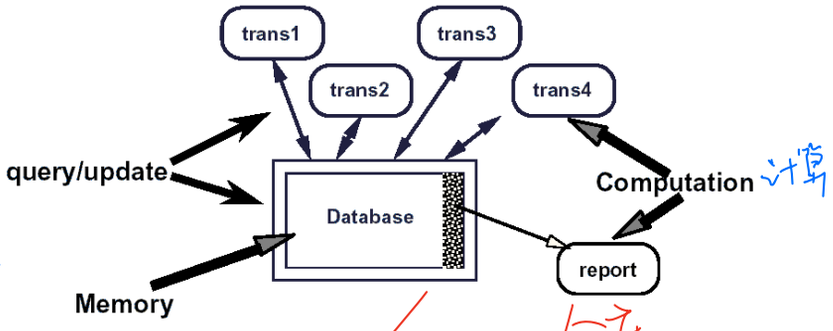


(A) Process control　　(B) Interpreter

(C) Blackboard　　(D) batch sequential

[　　]

5. Which architecture style does the following diagram describe?



(A) Blackboard　　(B) Repository

(C) Implicit invocation　　(D) Layered

[　　]

三、问答题(第 1 小题 38 分，第 2 小题 16 分，第 3 小题 16 分，共 70 分)

1、Quality Attribute and Architecture Style

A company plans to develop a software system for a specific kind of sweeping (扫地) robots. The system will control such a robot to move around and clean up the

indoor floor. A robot is designed to move in a room randomly. When the robot detects a rubbish (垃圾), it is supposed to gather the rubbish and continue to repeat such a step. If an obstacle（障碍物） blocks in its way, the robot should be able to bypass (绕过) the obstacle and move on. This software system is composed of several modules, containing sensor component, walking component, cleaning component, user interface and so on. The core module receives the information from sensor, and then controls walking and cleaning modules to execute tasks. The user interface of the system is in charge of giving operation orders and displaying the current state.

Following are some detailed requirements of this system.

(1) A robot may encounter（遭遇） a malfunction（故障） during working. The average recovery time should be less than 5 minutes.

(2) The system could be accessed remotely. Only authorized user can sign in and control and robot.

(3) The robot will be tested in real environment. The system should provide specific interfaces for this.

(4) When a sensor in the robot is changed, the corresponding software component should be updated by 2 developers within 3 days.

(5) Given a room within 20 square meters broad, the robot is required to sweep it in less than 1 hour.

(6) The user interface is required to be simple and friendly as far as possible.

分析上面的需求，回答下面 4 个问题——

问题一：Identify the related quality attributes according to the requirements.

需求编号	对应的 Q A
（1）	
（2）	
（3）	

需求编号	对应的 Q A
（4）	
（5）	
（6）	

问题二：For each quality attribute, give the corresponding quality attribute scenario.

	Availability	Modifiability
Source		
Stimulus		
Artifact		
Environment		

Response	刺激产生的结果	操作人员理解如何修改→进行修改→测试→部署
Response measure	如何评估响应	时间，成本

	Performance	Security
Source	可能来自系统内部或外部	攻击可能由人或其他系统发起
Stimulus	事件到来	对系统的攻击
Artifact	系统提供的服务	系统所提供的服务或系统中的数据
Environment	系统可能处于不同的模式	系统可能处于不同情况下
Response	系统处理到来的事件，可能导致状态的变化	合法用户正常使用，拒绝非法用户使用
Response measure	处理事件所花时间 处理的结果/丢失率 单位时间处理事件数目	发起攻击难度 从攻击中恢复难度

	Testability	Usability
Source	可能由不同角色发起	终端用户
Stimulus	系统可能到达了测试程序	终端用户希望学习系统的使用
Artifact	一个设计，一段代码，整个系统	整个系统
Environment	系统可能处于设计阶段|开发|部署	系统处于运行时或配置时
Response	理想：可以很好测试	系统响应用户要求
Response measure	白盒测试中的覆盖率	用户完成任务时间，出错次数，满意度，操作成功率

问题 3：For each quality attribute, list at least 2 tactics for archiving the corresponding quality attribute.

QA	tactics
Availability	ping/echo，心跳
Modifiability	模块高内聚，低耦合；让模块通用
Performance	处理数据量不变的情况下，提升计算效率；减少待处理的数据总量
Security	抵抗攻击，减少暴露
Testability	黑盒测试，白盒测试
Usability	系统给用户适当反馈，支持撤消操作

问题 4：According to the requirements, which software architecture style is better for this system? Describe the reason and list the advantages and disadvantages of architecture style you choose for the system.

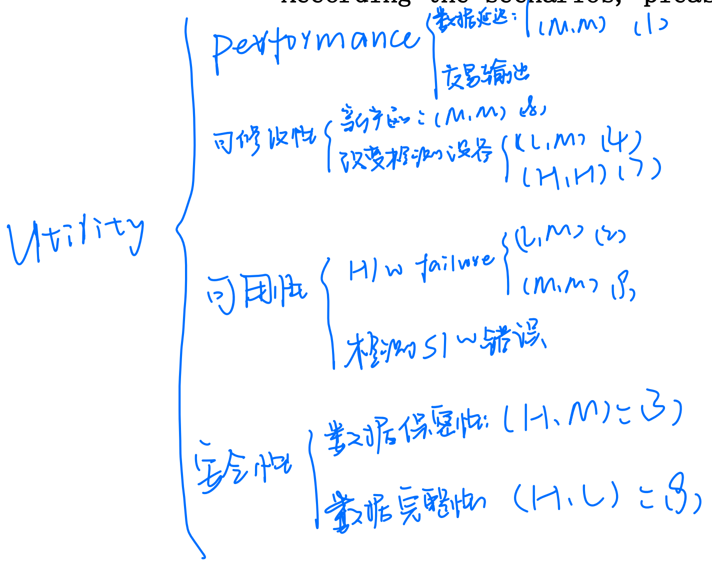
管道-过滤器：
适用场景：数据不断产生，系统需对这些数据进行处理
优点：1、构件具有高内聚，低耦合的特点
2、可测试性
缺点：不适合处理交互性强的应用
系统性能不高，并增加了编写过滤器的复杂性

2、构建 Utility Tree

A software company plans to develop an intelligent video surveillance system（智能视频监控系统）. The development team analyzed the Quality Attributes, designed architecture and wanted to use Utility Tree to evaluate the architecture, followings are the scenarios.

(1) A request to deliver real time video must be responded less than 3s. performance
(2) Power outage（断电） at site 1 requires traffic redirect to site 3 in less than 5 minutes. availability
(3) An authentication（认证） server should be deployed to support real name authentication. security
(4) Adding a middleware to system must be less than 10 person months. Modifiable
(5) Minimize storage latency on video DB to 300ms. performance
(6) Customer authorization（授权）database works 99.99% of the time. Security
(7) Change Web user interface to a flat UI style must be less than 10 person weeks. Modifi
(8) The development of a new Android client must be less than 2 person weeks. Modifi
(9) Network failure is detected and recovered in < 1.5min avali

According the scenarios, please construct a Utility Tree.



3、Architecture Evaluation

Identify and record risks and non-risks, sensitivity points and tradeoffs is an important task in architecture evaluation.

:

问题 1：Describe the definitions of risk, non-risk, sensitivity point and tradeoffs

风险：可能在将来会损害某些质量属性的方案

非风险：可以提高质量，帮助实现目标的决策

关键点/敏感点：方案中一个小小的变化，就可能某些质量属性产生很大的影响

权衡点：影响一个以上质量的决策

问题 2：Read the following descriptions and point out each description is a risks, non-risks, sensitivity points or tradeoffs.

(1) There is no way of detecting the failure of the communication line between server and clients.

(2) The number of simultaneous connections will significantly affect the number of transactions a database can process per second.

(3) Changing the algorithm of encryption could have an impact on both security and performance.

(4) The data sampling rate is once per second, and the processing time is less than 30ms.

(5) Discount policy for VIP is not clearly described. This could result in replication of functionality.

(6) A system with high modularity might have low portability and performance.

	描述编号（1-6）
Risks	1 5
Non-risks	4
Sensivity points	2
Tradeoffs	3 6