

NAME OF STUDENT :**STUDENT NUMBER :**

SUBJECT/VAK

SUPPLEMENTARY TP3/2 EXAM

DATE/DATUM

Feb 2013

TIME/TYD

2 HOURS

FACULTY OF INFORMATICS AND DESIGN

COURSE(S): ND: INFORMATION TECHNOLOGY FULL TIME

EXAMINER : MR B KABASO
INTERNAL MODERATOR : MR K NAIDOO
EXTERNAL MODERATOR : MR C KABUYA

SPECIAL INSTRUCTIONS/SPEZIALE INSTRUKSIES

This Test is not an open Book Exam
There are three sections in this paper and answer ALL sections
Write your ALL YOUR answers in the ANSWER BOOK provided
Both question paper and answer book should be handed back to the invigilator
ALL cell phones should be switched off. Even Silent mode is not allowed.

REQUIREMENTS/BENODIGDHEDE

None.

SECTION A

This section has 10 questions and each question carries 1 mark

1. In choosing how to model server-side components in a system design as layers or tiers, what best describes the relationship between the different tiers or layers?
 - A. Inheritance.
 - B. Separation of concerns.
 - C. Common re-use principle.
 - D. Scalability.
2. You have been asked to recommend an integration mechanism for two systems, A and B, but only A is written in Java. What do you recommend?
 - A. Web services
 - B. Java Connector Architecture (JCA)
 - C. FTP
 - D. Session beans
3. Consider the following statements about the two different Web authentication Techniques:

Statement A: HTTP basic – The developer controls the look and feel of the authentication process by supplying HTML forms.

Statement B: Form-based – The web browser prompts the user for a user name and password, and supplies this information in the request header.

Which of the following is applicable for the above?

- A. Both Statement A and B are true
 - B. Both Statement A and B are false
 - C. Statement A is true and Statement B is false
 - D. Statement A is false and Statement B is true
 4. Which of the following REST Web Service method provides a way to determine when a resource was last modified
 - A. POST
 - B. GET
 - C. HEAD
 - D. OPTIONS
 - E. UPDATE
-

5. Consider the following description of one of the transaction attributes used in Transactions:

The Tx attribute indicates that the method needs to be executed within a transaction. When a method with the Tx transaction attribute is called in the context of an existing transaction, it becomes a part of the ongoing transaction. If no transaction exists, then server container starts a new transaction before starting the execution of the method and ends the transaction on completion of the bean method.

Which of the following Transaction attribute can be replaced with Tx in the above description of the Transaction Attribute?

- A. Required
- B. RequiresNew
- C. Mandatory
- D. Supports

6. Which of the following IS NOT a benefits of Server Clustering?

- A. Replication
- B. Easy Manageability
- C. Load Balancing
- D. Fault Tolerance

7. HTTPS is defined as

- A. HTTP with Security
 - B. HTTP on secure line
 - C. HTTP over SSL
 - D. HTTP with SSL
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8. Compact Computers is a small computer assembly company. Their online application allows customers to pick and choose accessories to build their own PCs.

The accessories are:

i.Processor -800Mhz, 1Ghz, 1.2Ghz

ii. HDD - 40 GB, 60 GB, 80 GB

iii. Memory -128 MB, 256 MB, 512 MB

If a computer can have exactly 1 processor, 1 HDD and 1 memory stick, what pattern would be best used here?

- A. Factory Method
- B. Builder
- C. Prototype
- D. Abstract Factory
- E. Singleton

9. You are creating a web application for an online product ordering system. You have decided to use connection pooling to reduce load on the databases. Since you have many databases, you want to create one pool instance of the ConnectionPool class for each database. Depending on what is requested, you may have to connect to a variable number of databases. What pattern should you use?

- A. Factory Method
- B. Builder
- C. Prototype
- D. Abstract Factory
- E. Singleton

10. You have had enough with all the UML tools on the market as none do exactly what you want them to. So you've decided to design your own. However when designing it you realize that certain parts will be really complicated for example you have a Diagram object that is made up of lots of other objects. This diagram object can be used for a variety of different diagrams including class and sequence diagrams. When you create it you only want to specify its type and content. What pattern should you use?

- A. Abstract Factory
 - B. Factory Method
 - C. Builder
 - D. Decorator
-

--END OF SECTION A--

SECTION B (30 marks)

This section has 15 questions and each question carries 2 marks

1. One of the core software design principles states that Software entities (classes, modules, functions, etc.) should be open for extension but closed for modification. This principle is called OCP. Name two Design Patterns that enforce OCP?

2. Which Design principles are Stated formally as :

(i) for each object o1 of type S there is an object o2 of type T such that for all programs P defined in terms of T, the behaviour of P is unchanged when o1 is substituted for o2 then S is a subtype of T.

and

(ii) For an operation O on a class C, only operations on the following objects should be called: itself, its parameters, objects it creates, or its contained instance objects.

3. The Dependency Inversion Principle (DIP) formalizes the concept of abstract coupling. What is abstract coupling and what is its significance in software design?
 4. Domain-driven design (DDD) flows from the premise that the heart of software development is knowledge of the subject matter and finding useful ways of understanding that subject matter. In DDD terms what is meant by Ubiquitous Language and context mapping.
 5. In Domain-driven design (DDD), what is the difference between **Entity Objects** and **Value Objects**
 6. Explain these Terms in Domain-driven design (DDD): **Aggregates and Factories**.
 7. The motto of Test-Driven Development is RED, GREEN, REFACTOR. Explain what is meant by **RED** and **REFACTOR**
 8. Continuous integration (CI) is a set of practices intended to ease and stabilize the process of creating software builds. List two challenges that CI assists development teams.
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9. The core mission of a version control system is to enable collaborative editing and sharing of data.
List two strategies used to implement this.
10. List two HTTP methods that do the function of reading and deleting a web resource in a **REST** based web services application.
11. Switch statements (or their equivalent, *ifelseifelseif* structures) are not inherently bad. They become bad only when they make your design more complicated or rigid than it needs to be. In that case, it is best to refactor away from switch statements to a more object-based or polymorphic solution. Which two design patterns can be used to address the issue above?
12. List four participants, as defined by GOF, of a FACTORY METHOD Design pattern.
13. Duplicated code is the most pervasive and biggest problem in software. It tends to be either explicit or subtle. If the constructors of a class contain duplicated code, what design pattern can you use to remove duplicate code and explain how you would archive this.
14. In REST web services what does the acronym HATEOAS stand for and what is meant by the principle “Communicate Statelessly”
15. What is the OPTIONS and the HEAD methods used for in REST web Services?

--END OF SECITION B--

SECTION C: (50 Marks)

This section has 5 questions and each question carries 10 marks

Question 1:

a) There are three major features in object-oriented programming. One of them is Encapsulation. Encapsulation refers to the creation of self-contained modules that bind processing functions to the data.

i. Name AND define the other two features

(2 marks)

ii. One of the features in (i) conflicts with encapsulation. Name the feature and describe an alternative option available to a software designer who wants to avoid this conflict.

(2 marks)

b) The Law of Demeter is one of the core principles of design in software

i. Give one primary advantage and one primary disadvantage

(2

marks)

ii. Suggest an alternative to the Law of Demeter

(1 mark)

c) In Software Design, the following three principles govern package coupling and help us determine how packages should deal with the relationships between components and how they should be packaged.

For each principle, give a one line definition of each principle.

(3 marks)

i. The Acyclic Dependencies Principle (ADP)

ii. The Stable-Dependencies Principle (SDP)

iii. The Stable-Abstractions Principle (SAP)

Question 2:

Enterprise applications consist of components that can contain both protected and unprotected resources. Often, you need to protect resources to ensure that only authorized users have access.

- a) Explain what the following terms mean: **Authorisation, Authentication and Non-Repudiation**

(3

marks)

- b) Name 3 security characteristics that the establishment of a Secure Connection Using SSL guarantees

(3 marks)

- c) Client certificate authentication is a system widely used on the internet to set-up a secure channel . It requires a request for information from the server, and a response from the browser, to negotiate a trusted authentication relationship between the user (and their browser) and the server application. This trusted relationship is built through the use of the exchange of trusted and verifiable credentials, known as certificates. Describe, with the aid of the diagram, and showing all the parties involved, how a browser sets up a trusted channel of communication with a server. **(4 marks)**

Question 3:

In software development, besides the business requirements of a system, an architect must satisfy the service-level or quality of service (QoS) requirements, also known as non-functional requirements. As an architect, it is your job to work with the stakeholders of the system during the inception and elaboration phases to define a quality of service measurement for each of the service-level requirements. The architecture you create must address the following service-level requirements: performance, scalability, reliability, availability, extensibility, maintainability, manageability, and security. You will have to make trade-offs between these requirements.

- a) What two factors affect the performance of a system?
(2 marks)
- b) The most common practice to improve the system availability is through two types of replication, in which redundant hardware and software components are introduced and deployed. Name the two types of replication
(2 marks)
- c) Name two factors that affect the availability of a system
(2 mark)
- d) List three practices used to ensure extensibility in a system.
(3 marks)
- e) What is meant by vertical and horizontal scalability?
(1 mark)

Question 4:

a) Transactions in software are encapsulated in the acronym ACID, which defines the four core requirements of a transaction. Answer the following questions. (4 marks)

- i. What does Atomicity specifies ?
 - ii. What does Consistency refers to?
 - iii. What does Isolation defines?
 - iv. What does Durability ensure?
- b) List the four the settings used to control isolation behavior for a given transaction.
- c) In Java enterprise, using the **@Transactional** annotation, you can set some transactional behaviour and attributes. Propagation defines the transactional behaviour for the specified method. What transactional attribute is defined below

Execute the code within the “transactionalized” method non-transactionally and suspend the current transaction.

Question 5:

- a) There are two type of configuration in J2ME mobile applications. Name two types of configurations and for each configuration list the requirements need on the device to run the configurations

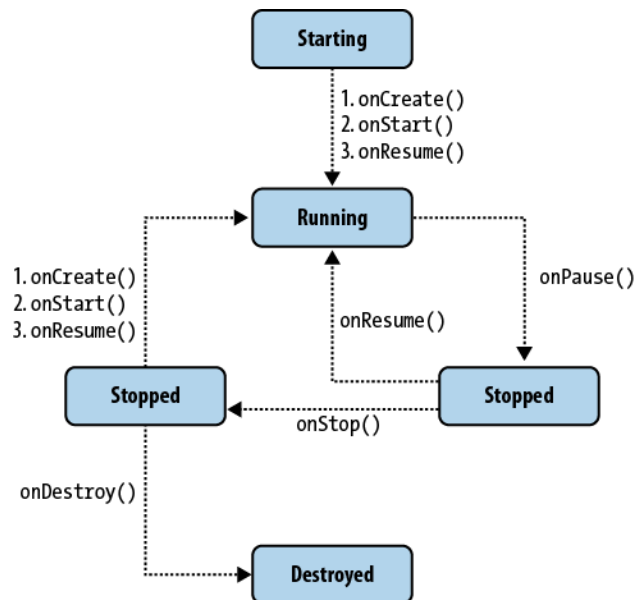
(2 marks)

- b) Android applications are made up of the following building blocks, Activities, Services , Content Providers and Intents. For each of the building blocks explain what they are and what they are used for.

(4 marks)

- c) The diagram below shows the life cycle of an android application

(4 marks)



- In what state is an Activity when it is not visible, but still in memory?
- In what state is an Activity when it doesn't exist in memory?
- In what state is an Activity when it is not in focus (i.e., not interacting with the user) but still visible on the screen.
- In what state is an Activity when it is currently on the screen and interacting with the user?

--END OF SECITION C--

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