Section A: Multiple Choice Questions 20 Marks

This Section has 20 questions and each question carries 1 mark

1. In an interview between the senior management of Happy Standard Banking Corporation and the Enterprise Application Architect Joe Superman, the following points were discussed:

   - The system needed to respond within 5 seconds
   - The system needs to have a 99.9 percent uptime
   - HSBC was in the process of acquiring another bank which would add two hundred thousand customers to their already existing half million.
   - Each phase of the SDLC was to have a clear sign-off process.
   - The development team was expected to provide a detailed unit test plan and user documentation.
   - In order to ensure privacy, HTTPS was to be used.

   What non-functional requirements were discussed?

   A. Scalability, Availability, Extensibility, Manageability and Security

   B. Performance, Reliability, Elaboration, Transition, Documentation and Security

   C. Performance, Reliability, Elaboration, Transition, Documentation and Security

   D. Specification, Elaboration, Construction, Transition, Use Cases and Security

   E. Performance, Availability, Scalability and Security

   F. Reliability, Availability, Scalability, Manageability and Security

2. N-tier applications show better performance than 2-tier applications because they are modular in nature, which means that they can be scaled easily, by tuning components and containers individually. Is this True/False ?

   A. True

   B. False

3. Julia Banda Inc. is building a Web Enterprise application for order entry and management of their clients software. Once the order is taken, it is submitted to a relational database. A provisioning system then queries data and makes appropriate calls to various subsystems using a messaging API. What design pattern is the messaging API using?

    A. Observer

    B. Mediator

    C. Adapter

    D. Bridge

    E. Visitor

4. 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:

    - Processor 1Ghz, 2Ghz, 2.8Ghz
    - HDD - 140 GB, 160 GB, 80 GB
    - Memory - 512 MB, 1 GB, 2 GB

    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

5. What design pattern separates the construction of a complex object from its representation so that the same construction process can create different representations?

    A. Abstract Factory

    B. Factory Method

    C. Builder

    D. Decorator

6. Which of the following is true about the Bridge and Adapter patterns?

    A. The Adapter pattern implements an interface known to its clients and provides an instance of a class not known to its clients and the Bridge pattern creates a separation between abstractions and classes that implement those abstractions.

    B. The Bridge pattern implements an interface known to its clients and provides an instance of a class not known to its clients.

    C. The Adapter pattern creates a separation between abstractions and classes that implement those abstractions.

    D. The Adapter pattern creates a separation between abstractions and classes that implement those abstractions and the Bridge pattern creates a separation between abstractions and classes that implement those abstractions.

7. As part of your new application you need to create a custom (your own) class loader so that you can implement with custom security. So you need to create objects without knowing the class of the objects or how to create them. What pattern should you use for this?

    A. Abstract Factory

    B. Factory Method

    C. Builder

    D. Prototype

    E. Singleton

8. What Design Pattern uses a private constructor to prevent a class from being instantiated via a constructor?

    A. Abstract Factory

    B. Factory Method

    C. Builder

    D. Prototype

    E. Singleton

9. You have a method that can execute in a transaction as part of that transaction but it doesn't matter if it doesn't. What is the correct demarcation attribute to use?

A. Supports

B. Not Supported

C. Mandatory

D. Required

E. Leave is empty as this is the default setting

10. What is the most important item in the list below that should be considered when designing an application?

    A. Scalability

    B. Maintainability

    C. Reliability

    D. Meeting the needs of the customer

    E. Ensuring the application is produced on time and within budget

    F. That the application is technically the best possible solution

11. Which behavioral Design Pattern centralizes communication between objects into a single object to can increase code maintainability?

    A. Chain of Responsibility.

    B. Notifier

    C. Observer

    D. Mediator

    E. Command

    F. State

12. You are designing an application that will need to use SSL to transmit data securely from one application to another. You know that you can easily get hold of existing implementations of SSL to use in your application but you'd like to learn more about SSL and have decided to implement your own version. You know that as part of the SSL handshake the client and server must agree a method of encryption. The problem is you don't know which method of encryption that will be. Which design pattern will help with this? Note: This is not a web-based application.

    A. Decorator

B. Interpreter

C. Strategy

D. Composite

E. Template Method

13. You are an IT Lecturer at Cape Peninsula University of Technology. You are giving a presentation of a new piece of software you have written. Basically you have written the next generation spell checker, the reason yours is so good is that it can learn the common typing mistakes of an individual user. You have already sold licenses to many major software vendors and plan to retire. However before you go they all require slight changes in the logic to suit their individual needs. What design pattern will help you slightly change the logic in a class to be used in many applications?

    A. Strategy

    B. Adapter

    C. Mediator

    D. Interpreter

    E. Template Method

14. In which of the following situations would you use the Observer pattern?

    A. When you need to co-ordinate state changes between other objects by using one object.

    B. You want one object to monitor when the state of another object but you don't want the object being monitored to need to send any messages regarding its state.

    C. When the instances of your class can be use interchangeable and you want to reduce the number of instances created in order to improve performance.

    D. You are building an online auction site to sell rare and collectable toys. You want customers to be notified of bids on items they are bidding for in as close to real time as possible. You would use the Observer pattern to notify the customer objects of changes in the auction object.

15. You need to access a complex object in a recursive way by building the object from other objects. What design pattern would you use?

A. Abstract Factory
B. Factory Method
C. Builder
D. Composite
E. Recursive Builder

16. You are currently designing your own Desktop Publishing application, as you have not found any that do exactly what you want with existing applications. As part of the design you are using a Controller to which you send all GUI requests. Not all objects can process the same commands. For example you can't select the spell check tool when an image has the focus. To stop any possible errors you would like to filter out some of the messages as they are passed from these objects to the Controller object. What pattern could you use?
    A. Firewall
    B. Proxy
    C. Adapter
    D. Observer
    E. Chain of Responsibility
    F. Filter

17. When would you use the Visitor pattern?
    A. You need two unconnected objects to be able to send messages to each other.
    B. You need two connected objects to be able to send messages to each other.
    C. You need to create a new operation on an object and you will change the classes of elements on which it operates.
    D. You need to create a new operation on an object without changing the classes of elements on which it operates.

18. Your have been contracted by a company to help them improve the performance of their sales application. You have suggested that the hardware the application is currently deployed on (2 web servers and a database server) be migrated to 3 web servers, an application server and a database server (all on different machines.) You assure them that all the software re-writes needed will be well worth it in the end. What are the characteristics of your suggested architecture?

A. Fat Clients

B. Thin Clients, Good separation of business logic, Good Scalability

C. Poor separation of business logic

D. Poor scalability

E. There is no difference in the separation of business logic

19. You have just bought a brand new dual processor server with over 10 Gigabytes of memory, the fastest server in its class. This server will host Apache Web server (shipped with the Oracle Database) and an Oracle 12g database. What are the most notable weaknesses of this architecture?

    A. Scalability

    B. Manageability

    C. Security

    D. Performance

20. You have an Enterprise Bean that represents a customer's account. One of the methods that this bean provides is deductCost(float amount) This method is used when a customer buys something from your company's website. This method must be executed as part of an existing transaction. What is the correct attribute setting in the deployment descriptor?

    A. REQUIRED

    B. REQUIRES NEW

    C. SUPPORTS

    D. MANDATORY

Section B: Short Answer Questions 30 Marks

This Section has 15 questions and each question carries 2 marks

1. List two benefits of Test Driven Development.
2. Give two characteristics of a good Unit Test.
3. What is subversion and why is it important in the management of a software group project?
4. Name and explain the two types of file conflict methods used for managing source code sharing in Software applications such as Subversion and CVS.
5. Because HTTP is a request-response protocol, individual requests are treated independently. Consequently, Web-based enterprise applications need a mechanism for identifying a particular client and the state of any conversation it is having with that client. Name two common methods used to keep this conversation state.
6. Name the the 2 forms that an Adapter Pattern can take and explain the difference.
7. Explain the difference between FORM Authentication and BASIC Authentication.
8. Two of the ACID properties of transactions are ATOMICITY and DURABILTY. Explain what each of these terms mean.
9. What is encapsulation and what design problem in software does this OO principle address?
10. Explain how inheritance breaks encapsulation and name the alternative method to inheritance.
11. What is polymorphism and what benefits does it bring to software design?
12. Good software design should have high cohesion and low coupling. What is meant by high cohesion and low coupling in software design?
13. Name two benefit of using Design Patterns.

14. Give the other name given to the Principle of Least Knowledge and explain what this principle mean.

15. What do the terms Non-Repudiation and Authorization mean in software security?

Section C: Themed Questions 50 Marks

This Section has 5 questions and each question carries 10 marks

QUESTION 1. Test Driven Development ..... (*10 Marks*)

(a) What is Unit Testing, Mock Testing and Integration Testing? (1)

(b) Define what a Test suite is and describe the advantage of using Test Suites. (1)

(c) List the four steps involved in building Test cases. (1)

(d) What is the Test Driven Development Philosophy (1)

(e) The motto of Test-Driven Development is "RED, GREEN, REFACTOR. Explain what each of the three terms-RED, GREEN and REFACTOR mean. (6)

QUESTION 2. MVC Design Pattern ..... (*10 Marks*)

(a) Most web applications are based on the traditional design pattern called MVC pattern. Explain what the MVC pattern is and fully describe the roles played by each of the three components involved in the MVC pattern. (3)

(b) On the INTERNET today there are two types of web applications. Those based on the request response model and those based on the event based model.

i. Describe the difference between the two models. (3)

ii. With the aid of a diagram describe the life-cycle process of Request/Response model. (4)

QUESTION 3. Software Design Principles ..... (*10 Marks*)

(a) State the meaning of each of the following Software Design Principles:

i. Open Closed Principle (OCP). (2)

ii. Liskov Substitution Principle (LSP). (2)

iii. Dependency Inversion Principle (DIP). (2)

(b) Acyclic Dependency Principle (ADP) states that dependencies between packages must form no cycles. With the help of a diagram, draw UML diagram that violates ADP and draw a second one that fixes the violation. (4)

QUESTION 4. Java Microedition (J2ME) ..... (*10 Marks*)

J2ME is the Java technology for powering mobile devices.

(a) Name two types of configurations and for each configuration list the requirements needed on the device to run the configurations. (2)

(b) What is the difference between MIDP and MDLETS? (2)

(c) List 4 minimum requirements needed to run a MIDLET? (2)

(d) With the aid of a diagram describe the life cycle of a MIDLET. (4)

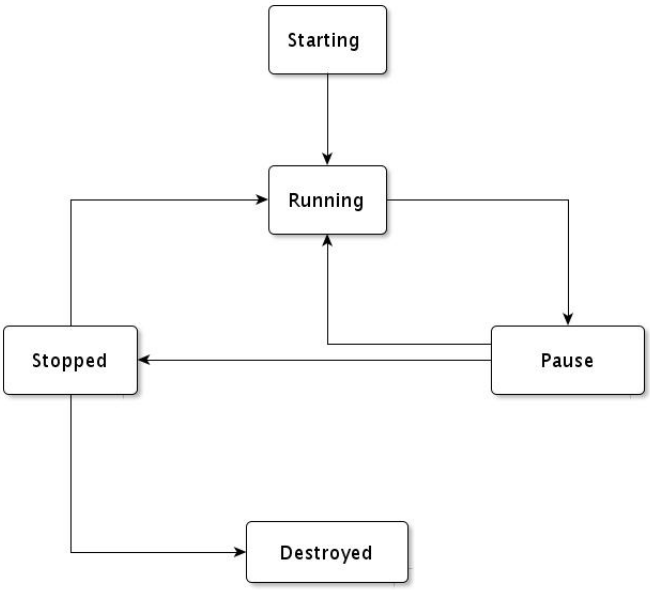

Figure 1: Android Application Life-cycle

QUESTION 5. Android Application ..... **(*10 Marks*)**

The Diagram above shows the life-cycle of an Android Application. Answer the questions that follow:

(a) Name three Android application methods that would move an application from the **Starting** state to the **Running** state. (3)

(b) When an application is running on a phone, name a method that would move the application into the **Pause** state. (1)

(c) What is the name of the method that would move the application from the **Paused** state to the **Running** state? (1)

(d) What method would move the Application activity from the **Stopped** state to the **Destroyed** state. (1)

(e) What method would move the application from the **Pause** state to the **Stopped** state. (1)

(f) Name three methods you would use to move an application from the **Stopped** state in the diagram to the **Running** state. (3)