

Higher National Diploma in Information Technology

Second Year – Second Semester -2012

IT4101- Multi-Tiered Application Development

Marking Scheme

Answer all questions in part A and any 2 questions in part B (20 marks each) only.

- **PART A – ANSWER ALL QUESTIONS**

1.

- a. Define the term Service Oriented Architecture. [03 Marks]

ANSWER

An architectural style of building software applications that promotes loose coupling between components so that you can reuse them and work within a distributed systems architecture

- b. List characteristics of SOA [05 Marks]

ANSWER (1*5)

- Services are discoverable and dynamically bound.
 - Services are self-contained and modular.
 - Services stress interoperability.
 - Services are loosely coupled.
 - Services have a network-addressable interface.
 - Services have coarse-grained interfaces.
 - Services are location-transparent.
 - Services are composable.
 - Service-oriented architecture supports self-healing.

- c. “*Services are stateless*”. Do you agree? Justify your answer. [04 Marks]

ANSWER

Yes. Services should minimize the amount of state information they manage and the duration for which they hold it. State information is data-specific to a current activity. If a service is responsible for retaining state for longer periods of time, its ability to remain available to other requestors will be impeded. Statelessness is a preferred condition for services and one that promotes reusability and scalability. For a service to retain as little state as possible, its individual operations need to be designed with stateless processing considerations.

- d. How services differ from a component? [03 Marks]

ANSWER

- Services do not have a 'requires' interface
- Services rely on message-based communication with messages expressed in XML

e. Why SOA is an important trend within the IT community? [05 Marks]

ANSWER

- Existing applications can be easily converted to services, to be consumed by existing or new applications.
- Monolithic, tightly coupled, inflexible applications will be replaced by SOA applications.
- Organizations will be better able to construct S/W to integrate business processes and respond rapidly to changes in the business environment.
- SOA uses shrink-wrapped s/w suites towards flexible, loosely coupled features.
- No close relationship between IT concepts and business concepts.
- etc

2.

a. What are the differences between XML and HTML [02 Marks]

ANSWER

XML	HTML
Extensible set of tags	Fixed set of tags
Content orientated	Presentation oriented
Standard Data infrastructure	No data validation capabilities
Allows multiple output forms	Single presentation

b. List the characteristics of Well-Formed XML Documents. [03 Marks]

ANSWER

An XML document is *well-formed* if

- Tags are syntactically correct
- Every tag has an end tag
- Tags are properly nested
- There is a root tag

- A start tag does not have two occurrences of the same attribute
- c. Write XML code that describes the given scenario. The root element is PARTS. The root element may contain no TITLE element or one TITLE element along with any number of PART elements. The PART element must contain one each of items ITEM, MANUFACTURER, MODEL, and COST in order. The PART element may contain an attribute called "type" which may have a value of "computer", "auto", or "airplane". The elements TITLE, ITEM, MANUFACTURER, MODEL, and COST all contain PCDATA which is parsed character data. [05 Marks]

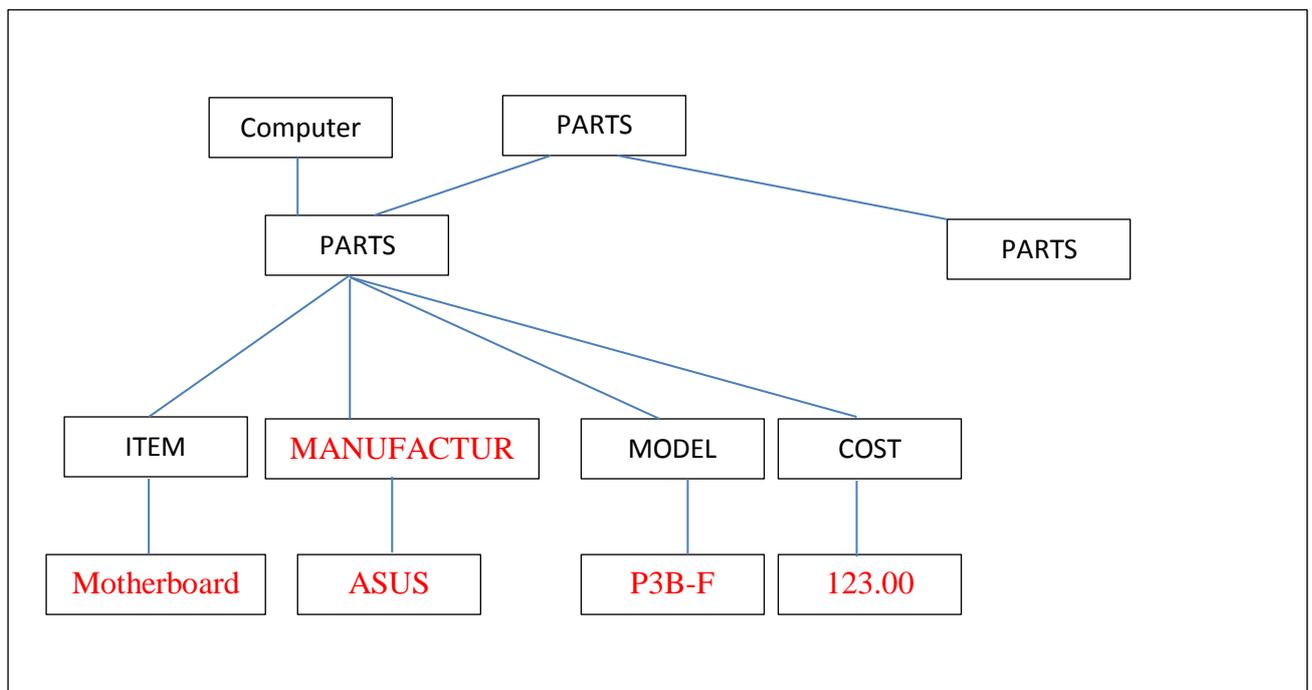
ANSWER

```

<PARTS>
  <PART type = "computer">
    <ITEM>Motherboard</ITEM>
    <MANUFACTURER>ASUS</MANUFACTURER>
    <MODEL>P3B-F</MODEL>
    <COST> 123.00</COST>
  </PART>
  <PART>
    <ITEM>Video Card</ITEM>
    <MANUFACTURER>ATI</MANUFACTURER>
    <MODEL>All-in-Wonder Pro</MODEL>
    <COST> 160.00</COST>
  </PART>
</PARTS>

```

- d. Draw the Tree View of the above XML document. [05 Marks]



- e. Write the DTD file for the above XML document. [05 Marks]

ANSWER

```
<!ELEMENT PARTS (PART*)>
<!ELEMENT PART (ITEM, MANUFACTURER, MODEL, COST)+>
<!ATTLIST PART
  type (computer|auto|airplane) #IMPLIED>
<!ELEMENT ITEM (#PCDATA)>
<!ELEMENT MANUFACTURER (#PCDATA)>
<!ELEMENT MODEL (#PCDATA)>
<!ELEMENT COST (#PCDATA)>
```

3.

- a. What are the two types of web services. [02 Marks]

- i. Big web services**
- ii. RESTful Web Services**

- b. Give one pros and con for each type of web services you mentioned. [04 Marks]

- i. pros

cons

- ii. pros

cons

- c. Give the name of Java EE6 API (Application Programming Interface) which is used to implement each type of web services respectively. [02 Marks]

- i. Big web services - JAX-WS API**
- ii. RESTful Web Services - JAX-RS**

- d. Mention the name of two different libraries (implementations) used to develop web services in java. [02 Marks]

- Jersey, the reference implementation Oracle,
- RESTeasy from Jboss
- Apache Wink from apache
- Restlet, created by Jerome Louvel

- e. What is annotation in java [02 Marks]

The Annotation is meta data about the program itself. In other words, organized data about the code, embedded within the code itself

- f. The following code segment shows a root resource class. There are some annotations or statements are missing. Fill the blanks with suitable statement or annotation by considering the given comments. [08 Marks]

```
import javax.ws.rs.Post;
import javax.ws.rs.Produces;
import javax.ws.rs.Path;
```

// This Java class will be hosted at the URI path "/worldOfService"

i) _____

```
public class Greeting{
```

// This Java method will process HTTP POST requests

ii) _____

// This Java method will produce content identified by the MIME Media type text/plain

iii) _____

```
public String sendGreeting() {
```

// This method return the message "Welcome to the world of web services"

iv) _____

```
}
```

```
}
```

PART B - Answer any 2 questions

4.

- a. What is Thread in Java? [03 Marks]

ANSWER

A Thread is a program that is executed independently of other parts of the programme.

- b. How can you implement a Thread? Give sample Java codes to each.

[06 Marks]

ANSWER

A Thread can implement in two ways:

- Extending the java.lang.Thread Class

```
public class HelloThread extends Thread {  
    public void run() {  
        System.out.println("Hello from a thread!");  
    }  
    public static void main(String args[]) {  
        (new HelloThread()).start();  
    }  
}
```

- Implementing the java.lang.Runnable Interface

```
public class HelloRunnable implements Runnable {  
    public void run() {  
        System.out.println("Hello from a thread!");  
    }  
    public static void main(String args[]) {  
        (new Thread(new HelloRunnable())).start();  
    }  
}
```

- c. What are the advantages of multithreading over multitasking [03 Marks]

ANSWER – (1*3 Marks)

- **Reduces the computation time.**
- **Improves performance of an application.**

- **Threads share the same address space so it saves the memory.**
- **Context switching between threads is usually less expensive than between processes.**
- **Cost of communication between threads is relatively low.**

d. “Every application has at least one thread”. Explain [04 Marks]

e. What is Synchronization? [04 Marks]

5.

a. What is JDBC? [03 Marks]

Answer:

JDBC is a standard interface for connecting to relational databases from Java.

The JDBC classes and interfaces are in the *java.sql* package

b. Which JDBC driver Type(s) can you use in three-tier architecture and if the Web server and the DBMS are running on the same machine? [02 Marks]

Answer:

- **Type 1 : JDBC –ODBC bridge**
- **Type 2 : Native-API/Partly Java driver**
- **Type 3 : Net-protocol / All –Java Driver**
- **Type 4 : Native-protocol / All Java Driver**

c. Write sample code segments for the following six steps. Assume that you are using a MySQL database for the following operations

- i. Load the JDBC Driver
- ii. Establish the Database Connection
- iii. Create a Statement Object
- iv. Execute a Query
- v. Process the Results
- vi. Close the Connection

[12 Marks]

Answer:

i. Load the JDBC Driver

```
Class.forName("com.mysql.jdbc.Driver").newInstance();
```

ii. Establish the Database Connection

```
String url="jdbc:mysql://localhost:3306/ studentData ";
```

```
Connection con = DriverManager.getConnection(url);
```

iii. Create a Statement Object

```
Statement stmt = con.createStatement();
```

iv. Execute a Query (Any valid SQL query)

```
ResultSet results = stmt.executeQuery("SELECT * FROM StudTable");
```

v. Process the Results (Any valid code)

```
while (results.next()) {
    String name = results.getString("Stud_NAME");
    int id = results.getInt("Stud_ID");
    System.out.print(name + " " + id);
}
```

vi. Close the connection.

```
stmt.close();
```

```
connection.close();
```

d. List Advantages of JDBC Technology.

[03 Marks]

ANSWER (1*3)

- Provide Existing Enterprise Data
- Simplified Enterprise Development
- Zero Configuration for Network Computers
- Full Access to Metadata
- A pure JDBC technology-based driver does not require special installation.
- The JDBC API includes a way to identify and connect to a data source, using a DataSource object. This makes code even more portable and easier to maintain.

6.

a. What is an **XML parser**?

[03 Marks]

Answer

A parser is a program that reads a document, checks whether it is syntactically correct, and tasks some action as it processes the document.

b. What is **JAXP**?

[03 Marks]

ANSWER

JAXP stands for Java API for xml processing. It provides the validation capability and parsing XML documents. There are three basic parsing interfaces in JAXP are DOM, SAX and Straming API for XML STAX..

- c. “*Java and XML are two great tastes that taste great together.*” Do you agree?

Justify your answer.

[05 Marks]

ANSWER

Agree. Reasons:

- XML maps well to Java
 - late binding
 - hierarchical (OO) data model
- Unicode support in Java
- XML Structures map well to Java Objects
- Portability
- Network friendly

- d. Briefly describe the following terms.

[09 Marks]

- i. XML Namespaces
- ii. XPath
- iii. XSLT

ANSWER

XML Namespaces

XML namespaces are used for providing uniquely named elements and attributes in an XML document. They are defined in , a W3C recommendation. An XML instance may contain element or attribute names from more than one XML vocabulary.

XPath

XPath is a language for selecting parts of an XML document.

XPath is designed to be used by XSLT, XQuery, and XPointer

XPath is a major part of the W3C XSL standard.

XSLT

- XSLT stands for XSL Transformations

- XSLT is the most important part of XSL
- XSLT transforms an XML document into another XML document
- XSLT uses XPath to navigate in XML documents
- XSLT is a W3C Recommendation

7.

- a. What is WS-SecurityPolicy? [03 Marks]

WS-SecurityPolicy is a web services specification, created by IBM and 12 co-authors, that has become an OASIS standard as of version 1.2. It extends the fundamental security protocols specified by the WS-Security, WS-Trust and WS-SecureConversation by offering mechanisms to represent the capabilities and requirements of web services as policies. Security policy assertions are based on the WS-Policy framework.

- b. List the primary aspects of security addressed by distributed computing. [05 Marks]

ANSWER

Identification, authentication, authorization, integrity, and confidentiality, and non-repudiation

- c. What is “Single sign-on”? Name three primary extensions that support the implementation of the single sign-on concept. [07 Marks]

Single sign-on technology allows a service requestor to be authenticated once and then have its security context information shared with other services that the requestor may then access without further authentication.

There are three primary extensions that support the implementation of the single signon concept:

- SAML (Security Assertion Markup Language)
- .NET Passport
- XACML (XMLAccess Control Markup Language)

- d. Briefly describe the Transport-level security and message-level security in Service Oriented Computing. [05 Marks]