Strathmore
UNIVERSITY

SCHOOL OF COMPUTING AND ENGINEERING SCIENCES (S.C.E.S)
BACHELOR OF INFORMATICS AND COMPUTER SCIENCE (B.I.C.S.)END OF SEMESTER EXAMINATION
ICS 2101: OBJECT – ORIENTED PROGRAMMING II

Date: 31st July 2023 **Time: 2 Hours**

Instructions
1. This examination consists of **FIVE** questions.
2. Answer **Question ONE (COMPULSORY)** and any other **TWO** questions.

Question One (30 marks)

a) During JDBC, establishing a connection is one of the significant steps that occur in order tofacilitate communication between an application and a given database. Using code snippets, write Java code to facilitate this step, ensuring you explain the parameters/arguments passed inthe methods that facilitate this process. **(5 marks)**

b) *Layout managers* are a key component of GUI. Justify why layout managers are key in thecreation of a GUI using 2 points, and mention, while describing briefly, at least 3 different layout managers that could be used. **(5 marks)**

c) During this modern age of the internet, web applications have revolutionized the way clientsinteract with different services. Servlets are an OOP concept that facilitate the creation of Java programs that run on a web server and can be deployed through web browsers. Among the multiple classes and interfaces in the Servlet API, we have the Servlet interface. Describe the three life-cycle methods that reside in this interface, stating their functions, and using Java, write the syntax of each of these methods.

(5 marks)

d) Explain the Singleton design pattern in Java. Provide an example of how it can be implemented, and discuss its advantages and potential drawbacks **(5 Marks)**

e) Describe the debugging process in software development. Explain the steps involved in effective debugging, including strategies for identifying and resolving bugs. Discuss the role ofdebugging tools and techniques in this process **(5 Marks)**

f) Explain the concept of threads in Java. What is the difference between a thread and a process? Discuss the benefits of using threads in a multi-threaded application **(5 Marks)**

Question Two (15 Marks)

a) The Observer design pattern is a behavioral design pattern used in software development. Explain the Observer pattern in detail, including its intent, structure, and participants. Provide a step-by-step implementation example of the Observer pattern in Java, demonstrating how it can be used to establish a one-to-many relationship between objects. Discuss the advantages and potential drawbacks of using the Observer pattern in a software system.

Note: Your answer should include a comprehensive explanation of the Observer pattern, its implementation, and its benefits and drawbacks. You may also include relevant code snippets or diagrams to support your answer **(10 Marks)**

b) Explain the Factory Method design pattern and its benefits. Provide a code example in Java to illustrate the implementation of the Factory Method pattern **(5 Marks)**

Question Three (15 marks)

a) ***Enterprise systems*** are large-scale software packages that are able to track and control all of the complex operations of a business. *Enterprise Beans* are an important aspect of OOP in the creation of a distributed enterprise system. Using an elaborate diagram, describe the various components that form the ecosystem of an Enterprise system. **(6 marks)**

b) There are three types of enterprise Java ***beans*** common in OOP. Describe these three, and in each instance, give an example. **(5 marks)**

c) There are *three* components that must go into the creation of an enterprise bean. Name and describe the purpose of each of these components. **(4 marks)**

Question Four (15 Marks)

a) Explain the concept of RMI (Remote Method Invocation) in Java. Discuss the steps involved in implementing RMI and provide an example code snippet to illustrate the usage of RMI in Java **(10 Marks)**

b) Explain the role of the RMI registry in Java RMI. Discuss the steps involved in starting the RMI registry and binding a remote object to it **(5 Marks)**

Question Five (15 marks)

a) ***Greenfoot*** is a visual and interactive Java tool that is used to create simple games, simulations and other graphical programs. Name and describe the purposes of the *three* key components on the main Greenfoot interface. **(3 marks)**

b) ***Alice*** is a Java tool that is used to create 3D animations in a fun and visually rich environment. *Procedures* are an important aspect in any Alice project. Define what a *procedure* is and assuming that you have an animation object of a **Biped,** name and describe 2 procedures that could be used to manipulate this object in an Alice scenario **(4 marks)**

c) ***Threads*** are an important technique in multitasking. Using Java snippets, describe the two common ways that can be used to create threads. **(8 marks)**