ECM2414

(with Answers)

UNIVERSITY OF EXETER

COLLEGE OF ENGINEERING, MATHEMATICS AND PHYSICAL SCIENCES

COMPUTER SCIENCE

Examination, January 2022

Software Development

Module Leader: Dr. Yulei Wu

Duration: ONE HOUR

This exam paper contains 50 multiple-choice questions. Each question may have more than one correct answers, and you must select all the correct answers in order to obtain the 2 marks for that question.

Answer ALL questions.

You should complete the exam using the answer sheet.

The marks for this module are calculated from 60% of the percentage mark for this paper plus 40% of the percentage mark for associated coursework.

This is a CLOSED BOOK examination.

Question 1

Choose the correct statement(s) about the `wait()` and `sleep()` methods in Java.

(A) `wait()` method must occur in a block synchronised on the monitor object.

(B) `wait()` method retains the lock when called and sacrifices the remainder of its timeslice.

(C) `sleep()` method does not need to occur in a synchronised block.

(D) `sleep()` method releases the lock when called and doesn't sacrifice the remainder of its timeslice.

(2 marks)

A, C

Question 2

Choose the correct statement(s) about *lambda expression*.

(A) A lambda expression allows you to pass a block of code around between objects.

(B) A lambda expression must have one or more arguments.

(C) A lambda expression allows argument type to be declared or inferred.

(D) In a lambda expression, a body with a single expression does not require curly brackets.

(2 marks)

A, C, D

Question 3

Choose the correct statement(s) about the good practice of using version control.

(A) Along with the use of version control systems, you can still use the Linux terminal for copying and moving files.

(B) If you have multiple projects, you should have distinct directory in the repository for each project.

(C) Version control can be used for assets such as images and sound files as well as source code.

(D) You don't have to change the file name using the version control system.

(2 marks)

B, C

Question 4

Choose the correct statement(s) about the creation of a singleton design pattern.

(A) You need to create a private static variable of a singleton class.

(B) You need to create a private constructor for making sure an outer class cannot instantiate an object from a singleton class.

(C) You need to create a global point of access to get a singleton instance.

(D) The singleton class can have multiple instances.

(2 marks)

A, B, C

Question 5

Choose the correct statement(s) about the *command pattern*.

(A) It encapsulates method invocation.

(B) It aims to let a command object encapsulate a request by binding together a set of actions on a specific receiver.

(C) The `Client` sets up the binding between a `Receiver` and a `ConcreteCommand`.

(D) The command pattern encapsulates a request as an object, thereby letting you parameterise other objects with different requests, queue or log requests, and supports undoable operations.

(2 marks)

A, B, C, D

Question 6

Choose the correct statement(s) about *type erasure*.

(A) Type erasure exists to ensure legacy code can operate with new code generated with more recent versions of Java.

(B) With type erasure, generics are erased during compilation to byte code.

(C) Due to type erasure, generics are only a syntactical check on Java code.

(D) With type erasure, generic instances can be made.

(2 marks)

A, B, C

Question 7

Choose the correct statement(s) about the *open-closed principle* in the object oriented programming design.

(A) Classes should be open for extension, but closed for modification.

(B) Classes should be open for modification, but closed for extension.

(C) Classes can be extended to incorporate new behaviours without modifying existing code.

(D) Classes should be modifying existing code in order to incorporate new behaviours.

(2 marks)

A, C

Question 8

Choose the correct statement(s) about the `synchronized` keyword.

(A) It can be used to address the race condition issues.

(B) The use of it may degrade system performance.

(C) The use of it will not degrade system performance.

(D) It can only be used with a method declaration.

(2 marks)

A, B

Question 9

Choose the correct statement(s) about the term *atomic access* when referring to reading and writing variables in Java.

(A) It either occurs or doesn't occur.

(B) Sometimes, atomic access allows intermediate states during reading a variable.

(C) All Java primitive data types provide for atomic access.

(D) The variable can be given atomic access through the use of keyword `volatile` in the declaration.

(2 marks)

A, D

Question 10

A program has a graphical user interface. How should this program be unit tested? Choose the correct answer(s).

(A) The graphical user interface has uncontrolled inputs, so it cannot be unit tested.

(B) A mock object can be used to replace the graphical user interface part of the program in order for it to be unit tested.

(C) If the graphical user interface part cannot be decoupled from the program, a re-design of the program is needed before considering to use the mock object for unit testing.

(D) The graphical user interface can be directly used for unit testing.

(2 marks)

B, C

Question 11

Choose the correct statement(s) about the `enum` type.

(A) It can be declared internally within a Java method.

(B) It cannot be declared internally within a Java method.

(C) All `enum` types are effectively static.

(D) It can be declared in a Java class.

(2 marks)

B, C, D

Question 12

Choose the correct statement(s) about the use of the `synchronized` and `volatile` keywords in Java.

(A) `volatile` is used in a method declaration.

(B) `volatile` is used in a variable declaration.

(C) `synchronized` is used in a method declaration.

(D) `synchronized` is used in a variable declaration.

(2 marks)

B, C

Question 13

Choose the correct statement(s) about the difference(s) between `synchronized` and `volatile` keywords in Java.

(A) `synchronized` may cause overheads, e.g., the operational cost of managing the monitors.

(B) `synchronized` does not cause overheads.

(C) `volatile` may cause overheads, e.g., the operational cost of managing the monitors.

(D) `volatile` does not cause as much overheads as `synchronized`.

(2 marks)

A, D

Question 14

Choose the correct statement(s) about *white-box* and *black-box* testing strategies.

(A) White-box testing is a test strategy in which the internal code of a method is known.

(B) In back-box testing, the internal operation of a method is also known.

(C) White-box testing is good for maximising code coverage in tests.

(D) Black-box testing can avoid "programmer bias".

(2 marks)

A, C, D

Question 15

With *Right-BICEP*, what questions should you ask yourself when you prepare unit tests?

(A) Are performance characteristics within bounds?

(B) Can you force error conditions to happen?

(C) Can you check the inverse relationships?

(D) Can you re-run the same test?

(2 marks)

A, B, C

Question 16

Choose the correct statement(s) about *sockets*.

(A) A socket is one endpoint of a two-way communication link between two programs running on the network.

(B) A socket class is used to represent the connection between a client program and a server program.

(C) A socket is a combination of an IP address and a port number.

(D) A socket can be used to distinguish different applications.

(2 marks)

A, B, C

Question 17

Choose the correct statement(s) about the advantages of using *generics* in Java programming.

(A) They allow compile time checking of Java types.

(B) They allow runtime checking of Java types.

(C) They remove the requirement to cast objects.

(D) They allow programs to be written for types to be specified at a later point.

(2 marks)

A, C, D

Question 18

Choose the widely accepted *object-oriented design principles*.

(A) Encapsulate what varies.

(B) Favour class inheritance over object composition.

(C) Strive for loosely coupled designs between objects that interact.

(D) Depend upon abstractions. Do not depend upon concrete classes.

(2 marks)

A, C, D

Question 19

Choose the correct statement(s) about the use of `Runnable` interface or the `Thread` class to create threads in Java.

(A) A class that implements the `Runnable` interface to create threads, can also extend other classes.

(B) A class that extends the `Thread` class to create threads, can also extend other classes.

(C) Implementing the `Runnable` interface is a lightweight way of creating threads.

(D) Extending the `Thread` class is a lightweight way of creating threads.

(2 marks)

A, C

Question 20

Which states are involved in the *thread lifecycle*.

(A) New state.

(B) Runnable state.

(C) Running state.

(D) Dead state.

(2 marks)

A, B, C, D

Question 21

Choose the correct statement(s) about the `notify()` and `notifyAll()` methods in Java.

(A) `notify()` wakes up one single thread that called `wait()` on the same object.

(B) `notify()` wakes up all the threads that called `wait()` on the same object.

(C) `notifyAll()` wakes up one single thread that called `wait()` on the same object.

(D) `notifyAll()` wakes up all the threads that called `wait()` on the same object.

(2 marks)

A, D

Question 22

Choose the correct statement(s) about the `yield()` and `sleep()` methods.

(A) When the `sleep()` method is called on a thread, it goes from the running state to the waiting/sleeping state.

(B) When the `yield()` method is called on a thread, it goes from the running state to the waiting/sleeping state.

(C) The `yield()` method stops a thread for unpredictable time.

(D) The `sleep()` method will cause a currently executing thread to sleep for the specified number of milliseconds.

(2 marks)

A, C, D

Question 23

Choose the correct statement(s) about the `run()` and `start()` methods.

(A) When the `start()` method is called, the main thread internally calls the `run()` method.

(B) When the `run()` method is called, the main thread internally calls the `run()` method to start a newly created thread.

(C) When the `run()` method is called, the main thread will not start a newly created thread.

(D) When the `start()` method is called, the main thread will start a newly created thread.

(2 marks)

A, C, D

Question 24

Choose the classes/interfaces involved in the *factory design pattern*.

(A) `Product`

(B) `Creator`

(C) `ConcreteCreator`

(D) `ConcreteProduct`

(2 marks)

A, B, C, D

Question 25

Choose the correct statements about the *factory design pattern*.

(A) You may use a factory design pattern when a class cannot anticipate which kind of class of objects it must create.

(B) You may use a factory design pattern when a class uses its subclasses to specify which objects it creates.

(C) A factory pattern exposes the implementation details.

(D) With the factory design pattern, the underlying implementation can be changed without any impact on the caller APIs.

(2 marks)

A, B, D

Question 26

Choose the correct statement(s) about the *Java reflection*.

(A) The reflection is the ability for a class or an object to examine or modify its runtime behaviour.

(B) The reflection can be used when you load and use classes that are unknown at the compile time.

(C) The reflection cannot be used when you test programs by forcing specific states.

(D) The reflection can be used when you inspect running programs by debuggers.

(2 marks)

A, B, D

Question 27

Choose the correct types of *code coverage* in software development.

(A) Method coverage

(B) Statement coverage

(C) Decision coverage

(D) Class coverage

(2 marks)

A, B, C

Question 28

Choose the correct statement(s) about the `ServerSocket`.

(A) A `ServerSocket` is used by a client program to listen for connecting requests from a server program.

(B) A `ServerSocket` is used by a server program to listen for connecting requests from a client program.

(C) It is used by a multi-threaded network server creating a new thread to handle each new client connection that it accepts.

(D) It is used by a multi-threaded network client creating a new thread to handle each new server connection that it accepts.

(2 marks)

B, C

Question 29

Within a version control system, given that *FileX.txt* and *FileY.txt* begin with the *file specific* version number 1.1 and the *revision specific* version number 0, choose the correct statement(s).

(A) FileX.txt is committed once, so the file specific version number of FileX.txt is 2.1.

(B) FileX.txt is committed once, so the file specific version number of FileX.txt is 1.2.

(C) FileX.txt is committed once, so the revision specific version number is 1.

(D) Both FileX.txt and FileY.txt are committed once, so the revision specific version number is 1.

(2 marks)

B, C

Question 30

Choose the correct examples of *liveness* issues of multi-threading programs.

(A) Race condition

(B) Deadlock

(C) Livelock

(D) Starvation

(2 marks)

A, B, C, D

Question 31

Choose the correct statement(s) about the benefits of Java Collection Framework.

(A) It can reduce programming efforts.

(B) It can foster the software reuse.

(C) It can reduce the effort to learn programming.

(D) It can increase programming speed and quality.

(2 marks)

A, B, C, D

Question 32

Choose the classes/interfaces involved in the *builder design pattern*.

(A) `Director`

(B) `Builder`

(C) `Product`

(D) `ConcreteBuilder`

(2 marks)

A, B, C, D

Question 33

Choose the correct statement(s) about *builder patterns*, *factory patterns*, and *abstract factory patterns*.

(A) A builder pattern constructs a complex object step by step depending on the data presented to it.

(B) A factory pattern uses inheritance and provides a complete object in one shot.

(C) An abstract factory pattern uses composition and returns a family of related classes.

(D) A factory design pattern is more useful than an abstract factory pattern.

(2 marks)

A, B, C

Question 34

Choose the correct statement(s) about the difference(s) between *unit testing* and *integration testing*.

(A) Unit testing is more important than integration testing.

(B) Unit testing is the testing of code at the function or method level.

(C) Integration testing tests that separate software components can be worked together.

(D) Integration testing is more important than unit testing.

(2 marks)

B, C

Question 35

Choose the correct statement(s) about *optimistic locking* in a version control system.

(A) It is used to prevent multiple developers from overwriting each others' changes.

(B) It is used to allow multiple developers to overwrite each others' changes.

(C) During a commit, if a file has changed since the local copy was updated, the commit fails until the local copy is updated to the latest version.

(D) Optimistic locking is more important than strict locking.

(2 marks)

A, C

Question 36

Choose the correct statement(s) about *listeners* in event-driven programming in Java.

(A) It is an object implementing a listener interface.

(B) It is notified if a specific type of event occurs.

(C) It doesn't have methods to handle the specific events.

(D) A source must register with a listener in order for it to be notified of the event.

(2 marks)

A, B, D

Question 37

Which of the following element(s) may be included in a Java class?

(A) Fields

(B) Methods

(C) Constructors

(D) Functions

(2 marks)

A, B, C

Question 38

Choose the correct statement(s) about the Client-side *Stub* and Server-side *Skeleton* in Java RMI.

(A) An instance of the Stub class is needed on each client.

(B) Client-side remote invocations are local invocations on the Stub class.

(C) Server-side Skeleton is responsible for listening for invocation requests on suitable IP ports.

(D) Server-side Skeleton is responsible for dispatching the invocation requests to the proper, locally resident remote objects.

(2 marks)

A, B, C, D

Question 39

Choose the correct statement(s) about the *Scrum* development methodology.

(A) It is a typical example of the agile development.

(B) It is based on short fixed-length sprints.

(C) It aims to produce deployable software in each sprint.

(D) It doesn't have daily meetings in order for the programmers to spend more time on their allocated tasks.

(2 marks)

A, B, C

Question 40

Choose the possible phase(s) involved in a software development lifecycle.

(A) Requirement analysis

(B) Design

(C) Implementation

(D) Testing

(2 marks)

A, B, C, D

Question 41

Choose the correct statement(s) about *local classes*.

(A) They are defined within a method.

(B) Their declaration can contain the public access modifier.

(C) They cannot access method local variables unless the variables are declared as final.

(D) They can access all the members of the outer class instance.

(2 marks)

A, C, D

Question 42

Choose the correct statement(s) about the *test-driven development*.

(A) It can help you design your code better.

(B) You design the code from the developer's point of view.

(C) You design the code from the user's point of view.

(D) The developed code is easier to be tested.

(2 marks)

A, C, D

Question 43

Choose the correct action(s) that a server should do in Java RMI.

(A) It makes remote objects.

(B) It generates accessible references to the remote objects.

(C) It waits for a client to obtain a reference.

(D) It sends the remote objects to a client.

(2 marks)

A, B, C

Question 44

Choose the correct statement(s) about what Java *reflection* can do.

(A) It can change values of fields.

(B) It can dynamically invoke methods.

(C) It cannot construct new objects.

(D) It can examine itself at runtime.

(2 marks)

A, B, D

Question 45

Choose the possible step(s) involved in the implementation of mock objects in unit testing.

(A) Use an interface to describe the object.

(B) Don't use an interface to describe the object.

(C) Implement the interface for a mock object for unit testing.

(D) Don't use an interface to implement mock objects.

(2 marks)

A, C

Question 46

Choose the possible component(s) involved in the right part of a V-model of software development.

(A) Unit testing

(B) Integration testing

(C) System testing

(D) User acceptance testing

(2 marks)

A, B, C, D

Question 47

Choose the correct testing method(s) of the *dynamic testing*.

(A) White box testing

(B) Black box testing

(C) Grey box testing

(D) Green box testing

(2 marks)

A, B, C

Question 48

Choose the correct statement(s) about the *software testing*.

(A) We have to test every single aspect of a system by enumerating all the possible inputs.

(B) We have to test every possible paths through the system.

(C) Testing can assert that the software functions correctly under all conditions.

(D) Testing can identify where functions incorrectly in a software under specific conditions.

(2 marks)

D

Question 49

Which of the following are version control systems?

(A) Git

(B) Mercurial

(C) Concurrent versions system

(D) Subversion

(2 marks)

A, B, C, D

Question 50

Choose the correct statement(s) about version control systems.

(A) It allows multiple developers to work on the same code base in a controlled manner.

(B) It keeps a record of changes.

(C) It cannot support multiple releases of a software at the same time.

(D) It allows multiple repositories in certain types of version control systems.

(2 marks)

A, B, D