**NTNU - Norwegian University of**

**Science and Technology**

**Department of Engineering Design**

**and Materials**

 

**EXAMINATION IN COURSE**

**TMM4230 Technology for Integrated Operations and Semantic Web**

**Technical contact during the exam**: Ole Ivar Sivertsen (97472129), Dag Olav Prestegarden (93439771) and Jon Atle Gulla (91347759).

**Phone**: 73592541

**Date** : 21st of May, 2011

**Time** : 09:00 – 13:00

**Weighting** : 7,5

**Aids allowed** : D: No written or handwritten examination support materials are permitted.

 Certain, specified calculator\*\* are permitted.

\*\* "Certain, specified calculator" means a calculator with simple, numerical and trigonometrical functions such as +, -, sine, cosine etc. The type of calculator is to be easy for examination invigilators to recognize.

All tasks are to be answered. Each answer has to be marked with the corresponding task-number and index. The answers must be clearly and nicely written. It will be emphasized that the text is clear and concise. Sketches should be made in such a scale that they are easily understood.

**Language** : English

**Number of pages** : 14

**Number of appendix** : 0

**To be subjected to censorship by 14th of June, 2011.**

**Note: Unless specified, select only ONE alternative. If more than one seems plausible, select the most correct one. Most tasks give 1 point for a correct answer, and 0 for a wrong answer, but some give more points and can also give a negative score. This is noted in the task text.**

Write the task number and the chosen alternative on your answer sheet. In some of the tasks, you are supposed to write an answer, not only select an alternative. This will be clearly specified in the task.

Part 1 - C# and .NET

#### *Task 1.1Given the following code, create a property Age that can both read and write the \_age value. Note: The number of lines required for the answer is not necessarily equal to the number of blank lines shown.*

class TestClass

{

 private int \_age;

 **< Insert property here>**

}

Task 1.2
Which of the following best describes the Common Language Specification (CLS)?

a) A set of features guaranteed to be in most .NET languages to allow interoperability.

b) The specification of a new, common programming language for .NET, like C# and Visual Basic.

c) The set of features common to the C# and Java programming languages

d) A short version of the C# language specification, including only the most common and

popular features.

Task 1.3
Which of the following are true about structures in C#

a) Structs are passed by reference and do not allow inheritance.

b) Structs are passed by reference, and allow inheritance.

c) Structs are passed by value, and do not allow inheritance.

d) Structs are passed by value and allow inheritance.

Task 1.4
Which of the following describes the access modifier protected

a) Accessible only within the same class.

b) Accessible only within same class and in any derived classes.

c) Accessible only within the same class and from derived classes within the same assembly.

d) Accessible only within classes in the same assembly.

e) Accessible from anywhere.

Task 1.5
When is the finally block in a C# try-catch loop executed

a) Only if the try block has executed without errors being raised.

b) Only if the try block raised an error and a catch block for the error has been executed.

c) Only if the try block has raised an error which has not been handled.

d) After the try and catch block, no matter if an error was raised or not.

Task 1.6
How do you invoke a destructor in C#?

a) You don't. The .NET runtime automatically calls the destructor of an object when it is garbage collected.

b) By using the delete keyword (delete myObj;).

c) By setting a variable pointing to the object to null (myObject = null;).

d) C# does not have destructors.

## Task 1.7The class CarDatabase exposes an event called SearchComplete. It is invoked when a previously started search for cars has finished. You have an instance of CarDatabase called cars and a method called search\_complete that need to be called when the search has finished. Write the code needed to subscribe to the event on your answer sheet.

Task 1.8
What will the following code print if it is run?

try

{

 int myFutureSalary = int.MaxValue;

 int raise = 1000;

 checked { myFutureSalary += raise; }

 Console.WriteLine(“win”);

}

catch

{

 Console.WriteLine(“fail”);

}

a) “win”.

b) “fail”.

c) The answer depends on the architecture of the computer (32 or 64 bit).

d) The code does not compile and cannot be run; nothing is printed.

## Task 1.9What is an assembly, and what does it contain?

a) A Visual Studio project file. It contains the information about the project and how it should be

assembled.

b) A file from the Base Class Library (BCL). It contains methods that can be used by others.

c) A collection of source code files in the Assembly language. These are the files that are used by

the Common Language Specification.

d) A DLL file that is made from compiling source code. It contains the MSIL code that is run

by the Common Language Runtime, metadata about the code and any resources needed.

Task 1.10
What is Silverlight?

a) A cross-browser, cross-platform implementation of the .NET Framework for building and delivering rich internet applications.

b) A framework for building Windows and Xbox games that can utilize DirectX.

c) A plugin for Visual Studio that allows the user to build web sites.

d) A toolkit that allows the creation of modern multimedia user interfaces.

Part 2 - Windows Communication Foundation

Task 2.1
A web service is...

a) An application that can communicate with other applications using SIP.

b) An application, accessible trough standard internet protocols, designed for machine to

machine interaction

c) An application that can run on both Linux servers and Windows desktops.

d) A program allowing two or more people to communicate using video and/or audio.

Task 2.2
Which of the following best describes what Windows Communication Foundation is?

a) A programming framework for .NET used to build applications that inter-communicate.

b) A set of amongst others, classes, assemblies and tools that enables design, implementation

and runtime for communication on the .NET framework.

c) An extension to the JIT compiler that enables it to compile web services.

d) Microsoft’s primary implementation of the HTTP protocol

e) None of the above

f) a) and b) above

g) a), b) and d) above

h) a), b), c) and d) above

Task 2.3
A WCF service must expose one or more endpoints. An endpoint consists of...

a) Address, Binding and Source Code

b) Address, Binding and Contract

c) Binding, Network and Interface

d) WSDL, UDDI and SOAP

Task 2.4
SOAP is used for...

a) Contract definitions

b) Message Exchange

c) Service Discovery

d) Service Provider Discovery

Task 2.5
You are implementing a simple search engine to search for cars through a web service. The service exposes a single operation “Search”, which takes a SearchArgument and returns an int with the number or cars matching the arguments. The operation contract (ICarSearch) and data object for the arguments (SearchArguments) are shown below. Fill in the missing lines by writing the line number and the missing code on your answer sheet.

 1: namespace CarSearch

 2: {

 3: **< Insert something here >**

 4: public interface ICarSearch

 5: {

 6: **< Insert something here >**

 7: int Search(SearchArguments args);

 8: }

 9:

10: **< Insert something here >**

11: public class SearchArguments

12: {

13: **< Insert something here >**

14: public string Manufacturer { get; set; }

15:

16: **< Insert something here >**

17: public int Model { get; set; }

18: }

19:}

Task 2.6
Choose four: When designing service oriented applications, and as a base for WCF, four principles are important. Which?

a) Only the schema, not the classes themselves should be relied upon when interacting with services.
b) Services allow us to reuse classes and their behavior across multiple systems.
c) Services and clients agree on an interface between them, but are otherwise completely independent.
d) Services and their clients are tightly coupled and should be developed together using the same programming languages and operating systems.
e) Boundaries between systems are explicit, and the client should actively chose to consume a service.
f) The fact that a service is not part of the local system should be hidden in order to avoid confusion and reduce cluttered source code.
g) All services should use the same protocols in order to allow every consumer to communicate with it.
h) Use policy-based compatibility to automatically determine how a consumer and a service should talk to each other.

Part 3 - Windows Workflow Foundation

Task 3.1
What are the two main types of workflows that can be created in Windows Workflow Foundation? (write the two names on your answer sheet – three words should be enough).

Task 3.2
In state machine workflows, can states be nested? I.e. can a state contain other states?

a) Yes
b) No
c) Only if the workflow is not defined to be long-lived
d) Only if the workflow is defined using XML

Task 3.3
In state machine workflows, can states be repeated? I.e. can you go from state A to B, then back to A?

a) Yes
b) No
c) Only if the workflow is not defined to be long-lived
d) Only if the workflow is a console application

***Task 3.4***

***Which alternative best describes how a workflow is executed?***

a) The workflow is compiled as a program that can be run by double clicking on it.
b) The workflow is compiled into many smaller programs, one for each activity. All of them are started and they communicate using inter process communication.
c) The workflow is run by the WF runtime engine library which can be used in most any application to host a workflow.
d) A workflow is run from within Visual Studio only.
e) None of the above.

Task 3.5
In addition to be created using the visual designer or a programming language, workflows can also be defined using...

a) The XML based language XAML (eXtensible Application Markup Language).
b) Comma Separated Values in a plain text file.
c) Windows Presentation Foundation
d) None of the above

Part 4 - Real Time Communication

Task 4.1
Real Time Communication is...

a) Asynchronous, same place
b) Asynchronous, different place
c) Synchronous, same place
d) Synchronous, different place

Task 4.2
SIP is used for...

a) Setup, management and teardown of sessions as well as transferring the actual data.
b) Transferring files.
c) Transferring live audio and video.
d) Setup, management and teardown of sessions.
e) None of the above.

Task 4.3
Which of the following statements are true for RTP?

a) RTP contains information about the real-time session so applications can easily adjust for jitter, improper packet sequencing, and dropped packets.
b) Each RTP packet contains one or more media payloads and other relevant information, such as time stamps and sequence numbers.
c) RTP replaces UDP in order to avoid latencies caused by packet loss.
d) RTP requires the use of UDP as transport protocol.
e) Both a) and b).
f) Both a) and c).
g) Both b) and c).

### Part 5 - Introduction to the Semantic Web

***Task 5.1***

***What is a correct statement about the Semantic Web?***

a) The Semantic Web is the formal specification of the semantic layer of the current web

b) The Semantic Web is an extension of the current web

c) The Semantic Web is a replacement of the current syntactic web

d) The Semantic Web is an application that manages web resources

e) The Semantic Web is a tool for building ontologies

***Task 5.2***

***What is represented at the transport/syntax level of the Semantic Web stack of languages?***

a) URIs/Namespaces

b) XML/XMLS

c) RDF

d) RDFS

e) OWL

***Task 5.3***

***Interoperability is central to the Semantic Web. What languages support structural interoperability?***

a) XML only

b) OWL only

c) RDF only

d) XML and RDF

e) RDF and OWL

***Task 5.4***

***What is not a full URI reference?***

a) http://www.restaurant.org/food#pizza

b) http://www.restaurant.org/food

c) isbn:1348229#item4

d) food-rest#pizza

***Task 5.5***

***What are the four main ontology applicatin scenarios described in Jasper & Uschold: “A Framework for Understanding and Classifying Ontology Applications”?***

a) Ontology as specification, common access to information, ontology-based search, and neutral authoring

b) Human communication, data access via shared ontology, data access via mapped ontology, and shared services

c) Application, task, domain and upper-level models

d) Common access to information, shared services, authoring ontologies, and ontology-based search

e) Authoring, accessing, sharing, and search

### Part 6 - Ontology languages

***Task 6.1***

***At which level of the Semantic Web stack do we introduce classes?***

a)RDF

b) XML

c) RDFS

d) OWL

***Task 6.2***

***What does RDFS stand for?***

a) Resource Description Framework Scheme

b) Resource Domain Framework Specification

c) Resource Description Foundation Scheme

d) Resource Domain Formal Specification

***Task 6.3***

***What is not possible to define in RDF/RDFS?***

a)Only persons can own cars

b) A car driver is a subclass of both person and adult

c) Peter is a car driver

d) Peter does not own cars

e) Peter owns cars

***Task 6.4***

***Which ontology language is the most expressive?***

a) UML class diagrams

b) RDFS

c) WordNet

d) OWL DL

e) OWL Full

***Task 6.5***

***Explain the notion of range and domain in RDFS?***

### Part 7 - OWL Modeling

***Task 7.1***

***X is an individual of class Y, that is not equal to the top-most class Thing. What is true about X?***

a) X is a subclass of Y

b) All instances of X are also instances of Y

c) X can be an instance of a class Z that is different from and not a superclass of Y

d)X only inherits properties from Y

e) X does not need to be an instance of Thing

***Task 7.2***

***In task 7.1 X is an individual of class Y, that is not equal to the top-most class Thing. What is not true about X?***

a) X is an instance of Y

b) X inherits all properties of Y

c) X is an instance of at least one other class than Y.

d**)** X’s subclasses inherits all properties of Y

e) X may be identical to another individual W

***Task 7.3***

***What is not true about classes in OWL DL?***

a) Classes may not have any instances

b) A class may be the instance of another class

c) There is only one class that is not the subclass of any other class

d) Classes may be defined as the complement of other classes

***Task 7.4***

***What is a potential relationship between hasBrother and hasSibling?***

a) hasBrother is a subclass of hasSibling

b)hasBrother is an instance of hasSibling

c) hasBrother is a subproperty of hasSibling

d)hasSibling is the range of hasBrother

e) hasSibling is the domain of hasBrother

***Task 7.5***

***What is correct about two disjoint classes X and Y?***

a) X and Y do not have any common superclasses

b) X and Y do not have common properties

c) An individual cannot be an intance of both X and Y

d)A class Z can have both X and Y as superclasses

e) Disjoint classes have no instances

***Task 7.6***

***How would you define the object property isFatherOf?***

a) Functional and transitive

b) Symmetric and functional

c) Symmetric and inverse functional

d) Transitive andinverse functional

e) Symmetric and transitive

**Part 8 - Abstract OWL Syntax**

***Task 8.1***

***Below are some statements in the Manchester abstract OWL syntax.***

*Objectproperty: write*

 *Characteristics: InverseFunctional*

 *Domain: Person*

 *Range: Book*

*Class: Student*

 *SubClassOf: Person and*

 *write some Thesis*

*Class: Professor*

 *SubClassOf: Person and*

 *write only Paper and*

 *lectures some Student*

*Class: Intellectual*

 *SubClassOf: Person and*

 *lectures some (Student OR Professor)*

*Individual: John*

 *Types: Person*

 *Facts: write SecretOfSemanticWeb*

Phrase these definitions in natural language.

***Task 8.2***

***What can we infer from the statements in task 8.1.***

a) All students are intellectuals

b) All professors are intellectuals

c)Students do not write papers

d) Professors may be students

e) John is not a student

***Task 8.3***

***Interpret the following statement in the Manchester abstract syntax and write a corresponding statement as a natural language sentence.***

Class: HappyPolitician

 SubClassOf:

 Person and

 isMemberOf EXACTLY 1 (PoliticalParty THAT

 hasMember SOME (Politician THAT

 isPartOf Government))

***Task 8.4***

***Translate the following definition of students into the Manchester OWL abstract syntax: “A happy student is a student that follows minimum 4 courses and owns either a laptop or a tablet”***

***Task 8.5***

***Translate the description of persons into the Manchester OWL syntax: “An art lover likes painters. An art expert is an art lover that likes only Picasso or Munch.”***

### Part 9 - Ontology Engineering

***Task 9.1***

***Why is the political aspects of ontology engineering often more challenging than the technical aspects?***

***Task 9.2***

***What is the different between ontology engineering and ontology learning?***

a) Ontology engineering is manual ontology building. Ontology learning is automatic ontology building.

b) Ontology engineering is the discipline of building ontologies. Ontology learning is a subdiscipline of ontology engineering

c) Ontology learning is the discipline of adapting a ontology engineering methods to concrete modeling tasks

d) Ontology learning and ontology engineering are synonomous.

***Task 9.3***

***Given the following documents in a document set:***

Document 1: {b, c, c, a, d, a}

Document 2: {a, b, c}

Document 3: {d, c, a, d}

**What is the tf.idf score of term a in docment 1 (show calculation)?**

***Task 9.4***

***What is the purpose of tf.idf scores in ontology learning?***

a) Tf.idf scores identify which terms may be candidate concepts in ontologies

b) Tf.idf scores separate terms into classes, individuals and properties

c) Tf.idf scores disambiguate related terms

d) Tf.idf scores identify hierarhical relationships between concepts

### Part 10 - Reasoning

***Task 10.1***

***What is an interpretation of an ontology in Description Logic?***

a) A population of an ontology with instances of all classes and properties

b) A domain of real-world objects

c) The common understanding of the stakeholders building the ontology

d) A possible world that materializes the ontology

***Task 10.2***

***What is the difference between the Abox and the Tbox in Description Logic?***