

Department of Engineering Design and Materials

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

**INCLUDING SOLUTIONS**

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**Examination date:** June 6, 2013

**Examination time (from-to):** 15:00 – 19:00

**Permitted examination support material:** 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.

**Other information:** 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 pages enclosed:** 0

**Checked by:**

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Date Signature

**Note: Some of the .NET questions (Part 1 to part 5) may have multiple correct answers, choose all that apply. A wrong answer will reduce the score for the task, but never result in negative score for a task**

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 1.1  
Which of the following statements are TRUE about the .NET CLR?***

1. It provides a language-neutral development & execution environment**.- correct**
2. It ensures that an application would not be able to access memory that it is not authorized to access **- correct**
3. It provides services to run "managed" applications. **- correct**
4. The resources are garbage collected. **- correct**
5. It provides services to run "unmanaged" applications.

***Task 1.2***  
***Which of the following are NOT true about .NET Framework?***

1. It provides a consistent object-oriented programming environment whether object code is stored and executed locally, executed locally but Internet-distributed, or executed remotely.
2. It provides a code-execution environment that minimizes software deployment and versioning conflicts.
3. It provides a code-execution environment that promotes safe execution of code, including code created by an unknown or semi-trusted third party.
4. It provides different programming models for Windows-based applications and Web-based applications. **- correct**
5. It provides an event driven programming model for building Windows Device Drivers. - **correct**

***Task 1.3  
Which of the following is a correct way to create an object of the class* Sample*?***

1. *Sample s = new Sample();* ***-* correct**
2. *Sample s;*
3. *Sample s; s = new Sample();* ***-* correct**
4. *s = new Sample();*

***Task 1.4  
Which of the following statements is correct about the C#.NET code snippet given below?***

|  |
| --- |
| class Sample  {  private int i;  public Single j;  private void DisplayData()  {  Console.WriteLine(i + " " + j);  }  public void ShowData()  {  Console.WriteLine(i + " " + j);  }  } |

1. *j* cannot be declared as *public*.
2. *DisplayData()* cannot be declared as *private*.
3. *DisplayData()* cannot access *j*.
4. *ShowData()* cannot access to *i*.
5. There is no error in this class. **- correct**

***Task 1.5***

***If a class is using an INTERFACE, it must***

1. inherit the properties of the interface
2. contain the same methods as the interface
3. create an interface object
4. all of the above **- correct**

**Part 2 – .Net and Semantic Web, Silverlight**

***Task 2.1  
What is the output of the following code?***

|  |
| --- |
| public void Iterate\_Predicates\_of\_a\_Node()  {  String subject = "http://www.intellidimension.com/people#JBarron";  String foaf = "http://xmlns.com/foaf/0.1/";  GraphDataSource graph = new GraphDataSource();  graph.Add(subject, foaf + "name", new RdfLiteral("Justin Barron"));  graph.Add(subject, foaf + "mbox", new RdfLiteral("jbarron@intellidimension.com"));  graph.Add(subject, foaf + "knows", new RdfUri("http://www.intellidimension.com/people#GChappell"));  foreach (RdfUri predicate in graph[subject].GetPredicates())  Console.WriteLine(predicate);  } |

ANSWER

http://xmlns.com/foaf/0.1/knows  
http://xmlns.com/foaf/0.1/mbox  
http://xmlns.com/foaf/0.1/name

***Task2.2***

***The query results (in Intellidimensions RDF API) are returned in \_\_\_\_\_\_***

1. An RDF array
2. A list collection object
3. An RDF Table object **- correct**
4. none of the above

***Task2.3***

***What is a XAP file in Silverlight?***

***ANSWER provided in the Silverlight lab***

A **XAP** file (pronounced "zap") is basically a compressed output file for the Silverlight application containing Silverlight solution components such as the compiled XAML and code-behind, an application manifest and possibly one or more assemblies delivering Silverlight controls.

Silverlight Application (XAP) generally loads inside the ASPX or HTML pages pointing to the path to load the XAP.

***Task2.4***

***XAML is used ….***

1. to interoperate Silverlight applications in Linux
2. as a protocol for network applications in Silverlight
3. to develop user interface components in Silverlight - **correct**
4. to package all the libraries of a Silverlight application
5. none of the above

***Task 2.5***

***Beside Silverlight, which of the following technologies uses the XAML language?***

1. WCF
2. WWF - **correct**
3. WPF - **correct**
4. All of the above
5. None of the above

**Part 3 – Web Services, WCF and SOA**

***Task 3.1  
Which of the alternatives below lists technologies, in the same order, corresponding to the following items:***

***1) represent data (structured storage), 2) message protocol, 3) data- and operation contract.***

1. UDDI, XML, SOAP
2. XML, SOAP, WSDL **- correct**
3. DISCO, XML, WSDL
4. None of the above

***Task 3.2***

|  |
| --- |
| <system.serviceModel>  <services>  <service name="OrdbokService.OrdbokService">  <endpoint address="" binding="wsHttpBinding" contract="OrdbokService.IOrdbokService">  <identity>  <dns value="localhost" />  </identity>  </endpoint>  <endpoint address="mex" binding="mexHttpBinding" contract="IMetadataExchange" />  <host>  <baseAddresses>  <add baseAddress="http://localhost:8731/Design\_ Time\_Addresses/OrdbokService/Service1/" />  </baseAddresses>  </host>  </service>  </services>  </system.serviceModel> |
|  |

***The text snippet above is most likely taken from:***

1. A WSDL file saved on disk
2. A WSDL generated by a running web service
3. A WCF configuration file **- correct**
4. A SOAP Message being transmitted between server and client.
5. An XSD Schema
6. Both a) and b) above
7. None of the above

***Task 3.3***

***Given the code in C#, written for a WCF service. What are we trying to create here?***

|  |
| --- |
| string serviceAddress = "http://localhost/SampleServices/Service"; |
| BasicHttpBinding basicHBinding = new BasicHttpBinding(); |
| using (ServiceHost hostService = new ServiceHost(typeof(Service1))) |
| { |
| hostService.AddServiceEndpoint(typeof(IService1), basicHBinding, serviceAddress); |
| } |
|  |

1. A service contract
2. A service behavior
3. An endpoint **- correct**
4. All of the above
5. None of the above

***Task 3.4  
What is the relation between SOA (Service Oriented Architecture) and WCF?***

1. WCF and SOA is the same
2. WCF is Microsoft’s platform for, amongst others, building SOA applications **- correct**
3. SOA is a specific technology, WCF is a generalized view of how distributed applications should be built
4. None of the above

***Task 3.5  
You connected to a web service, and invoked a call to a function. In which format are you getting the results back?***

1. SOAP
2. WSDL
3. XML **- correct**
4. All the above

***Task 3.6***

***The code below implements an interface ITradingService as a service contract. Looking at the implementation, please write the interface with correct attributes.***

namespace Fabrikam

{

public class TradingSystem: ITradingService

{

#region ITradingService Members

string ITradingService.BeginDeal()

{

string dealIdentifier = Guid.NewGuid().ToString();

return dealIdentifier;

}

void ITradingService.AddTrade(Trade trade)

{

Console.WriteLine("Added trade for {0}",trade);

}

void ITradingService.AddFunction(string function)

{

Console.WriteLine("Added function {0}",function);

}

decimal ITradingService.Calculate()

{

Decimal value = DateTime.Now.Millisecond/10;

Console.WriteLine("Calculated value as {0}",value);

return value;

}

void ITradingService.Purchase()

{

Console.WriteLine("Purchased!");

}

void ITradingService.EndDeal()

{

Console.WriteLine("Completed deal.");

}

#endregion

}

}

ANSWER

namespace Fabrikam

{

[ServiceContract]

public interface ITradingService

{

[OperationContract]

string BeginDeal();

[OperationContract]

void AddTrade(Trade trade);

[OperationContract]

void AddFunction(string function);

[OperationContract]

decimal Calculate();

[OperationContract]

void Purchase();

[OperationContract]

void EndDeal();

}

}

***Task 3.7  
Beside Interoperability and Service-oriented Development, one characteristic of WCF is Unification. What does it unify?***

***ANSWER***

***It unifies all the distributed technologies of Microsoft so we no longer need to create separate projects for separate technologies but work under the roof of WCF to avail all the libraries of .Net Remoting, Message-Oriented Programming,WSE,Enterprise Services and ASMX.***

***Task 3.8***

***Looking at the code provided in Task 3.2, the administrator of the webservice decides to change the binding to*** *basicHttpBinding****. What will the consequence as a result of this change?***

ANSWER

Security is compromised since the default mode of basicHttpBinding is no security.

**Part 4 - Windows Workflow Foundation**

***Task 4.1  
Complete the Architectural Diagram of the WWF.***

**HOSTING LAYER**

Runtime Services

-Communication,Persistance Custom Services

-Tracking,Timer

-Transactions,Threading

**RUNTIME LAYER**

Execution: Rules,Tracking,Scheduling

Lifecycle: State,Activation

**???**

ANSWER

MODEL LAYER

Activities

* Custom -Workflows
* Built-in -Rules

***Task 4.2  
Every workflow has a GUID which identifies the workflow. It is used to***

1. Keep the database in normalized form.
2. Achieve long running executing by loading/unloading the workflow in the memory.- **correct**
3. Make the workflows trackable.
4. Allow the input/out of the workflow to be formatted in XML

***Task 4.3  
The state of the workflows can be saved in a database. This service is provided by***

1. Execution Service
2. Transactional Service
3. Persistance Service **- correct**
4. Scheduling Service
5. None of these

***Task 4.4***

***Can you integrate workflow applications with some other applications, such as Windows Forms applications and Web applications?***

1. Yes - **correct**
2. No
3. May be

**Part 5 - Real Time Communication**

***Task 5.1  
What is e-Collaboration? Give an example of any e-collaboration technology you used during any of your student projects at NTNU and why was it chosen?  
ANSWER from Slides***

Collaboration using electronic technologies among different individuals to accomplish a common task.

There are many examples for e-collaboration technologies (Skype, dropbox, sharepoint, gotomeeting, adobe connect, google hangout, google docs and many many more) and selection of a technology is purely based on needs and available resources. The selection of a technology used by a student should be explained with a reason or two.

***Task 5.2  
What does SIP (Session Initiation Protocol) do?***

1. Sets up, manages and tears down sessions (such a voice or video calls) between parties - **correct**
2. Sets up, transfers/communicates the content of sessions (for instance the video images if it is a video call) and tears down sessions
3. Replaces IP (Internet Protocol) for multimedia calls/sessions (such as voice calls) since IP is not well suited for such applications
4. Compresses voice or video data to achieve better quality when doing multimedia calls over low bandwidth links

***Task 5.3***

***What is the Telepresence technology? Can you name any example in your answer?***

***ANSWER***

Refers to a set of technologies which allow a person to feel as if they were present physically in the meeting. The technology replicates the brains preferences for interpersonal communications and implements the human sensory elements of vision,sound and manipulation. Therefore we get the life-size participants, fluid motion,accurate flesh tones and appearance of a true eye contact.

Examples are HP Halo,Cisco Telepresence, Polycom, Teliris etc.

***Task 5.4***

***You have a distributed team working in an “e-learning project”. The team members are located in Dubai, London and Trondheim. Your budget is limited. Remember the technologies covered in the lecture and with your personal experience, write down your choice of technologies you choose to collaborate with your team-members in the project. You must justify your choices with proper reasoning.***

ANSWER:

There is no right or wrong answer. The marking is based on the appropriateness and justification of the technologies.

**Part 6. Introduction to the Semantic Web**

***Task 6.1***

***What is the purpose of the ontology in the Semantic Web?***

1. A model that defines an unambiguous terminology for giving meaning to data and documents **= TRUE**
2. A semantic language for modeling domain phenomena
3. A stack of languages that replaces HTML and XML for the World Wide Web
4. A model that uniquely identifies web resources
5. A database model for web applications

***Task 6.2***

***What is not a property of ontologies?***

1. Represents a shared understanding of a domain
2. Executable specification **= TRUE**
3. Formal specification
4. Abstract model of some domain phenomena
5. Includes a class hierarchy

***Task 6.3***

***What is the relationship between XML and RDF in the Semantic Web stack of languages?***

1. XML and RDF together make up RDFS
2. RDF is serialized in XML **= TRUE**
3. RDF defines the presentation of XML documents
4. XML and RDF are both subsumed by OWL
5. XML is formally defined by RDF tuples

***Task 6.4***

***What is a URI?***

1. Uniform Resource Identifier
2. Unique Resource Instantiation
3. Uniform Resource
4. Unclassified Resource Instance
5. Unique Resource Identifier

***Task 6.5***

***Which of these languages is based on Description Logic?***

1. XML
2. OWL DL **= TRUE**
3. OWL Full
4. RDF
5. RDFS

**Part 7 RDF Modeling**

***Task 7.1***

***RDF triples consist of subject, objects and properties. What cannot be an object in an RDF triple?***

1. URI
2. Binary relation **= TRUE**
3. Resource
4. Literal
5. Empty node

***Task 7.2***

***What does the following Turtle RDFS specification mean?***

|  |
| --- |
| @prefix ex: <http://someurilocation> .  ex:car rdf:type ex:motorvehicle; ex:hascomponent [ex:component ex:wheel; ex:number “4”] . |

|  |
| --- |
| *A car is a motor vehicle and has4 wheels as components.* |

***Task 7.3***

***How would you use the Turtle syntax to specify in RDFS that good students attend lectures and all students are person?***

|  |
| --- |
| *@prefix ex: <http://someurilocation> .*  *ex:GoodStudent rdfs:subClassOf ex:Student; ex:attend ex:Lecture .*  *ex:Student rdfs:subClassOf ex:Person .* |

***Task 7.4***

***Which type of list is defined in RDFS?***

1. Container **= TRUE**
2. Bag
3. Alt
4. Seq
5. Collection

***Task 7.5***

***Use reification to represent “the professor thinks that students like ice creams” in RDFS (Turtle syntax).***

|  |
| --- |
| *@prefix ex: <http://someurilocation> .*  *ex:professor ex:thinks ex:opinion .*  *ex:opinion rdf:subject ex:student .*  *ex:opinion rdf:predicate ex:likes .*  *ex:opinion rdf:object ex:iceCream .* |

**Part 8 OWL Modeling**

***Task 8.1***

***What is the correct relationship between owl:Thing and owl:Nothing?***

1. owl:Nothing is a subclass of owl:Thing **= TRUE**
2. owl:Nothing is a superclass of owl:Thing that cannot have instances
3. owl:Nothing and owl:Thing are both subclasses of owl:Resource
4. owl:Nothing and owl:Thing are disjoint classes

***Task 8.2***

***What is a transitive property in OWL?***

1. If x is not related to y and y is not related to z, then x is not related to z
2. If x is related to y and x is related to z, then y is related to z
3. If x is related to y, there can be no other z related to x with the same property
4. If x is related to y, then y is related to x
5. If x is related to y and y is related to z, then x is related to z **= TRUE**

***Task 8.3***

***An OWL ontology specifies that Bille plays for Rosenborg, Bille plays for Molde, and a player can only play for one club. How can this be possible?***

|  |
| --- |
| *Open World Assumption: Rosenborg and Molde are assumed to be the same club.* |

***Task 8.4***

***What is true about X?***

|  |
| --- |
| <owl:Class rdf:about=”C1” >  <rdfs:subClassOf rdf:resource=”C2” />  </owl:Class>  <owl:Class rdf:about=”C3” >  <owl:disjointWith rdf:resource=”C2” />  </owl:Class>  <C1 rdf:about=”X” /> |

1. X is a subclass of C1
2. X is a a property of C1
3. X is an instance of C2 **= TRUE**
4. X is an instance of C3

***Task 8.5***

***What do these OWL statements say about courses?***

|  |
| --- |
| <owl:Class rdf:about=”Course”>  <rdfs:subClassOf>  <owl:intersectionOf rdf:parseType=”Collection”>  <owl:Restriction>  <owl:onProperty rdf:resource=”hasLecturer” />  <owl:allValuesFrom rdf:resource=”Professor” />  </owl:Restriction>  <owl:Restriction>  <owl:onProperty rdf:resource=”hasLecturer” />  <owl:someValuesFrom rdf:resource=”Person” />  </owl:Restriction>  </owl:intersectionOf>  </rdfs:subClassOf>  </owl:Class> |

|  |
| --- |
| *All lecturers of a course are professors, and a course must have at least one lecturer.* |

**Part 9 Semantics and Reasoning**

***Task 9.1***

***What are the basic primitives in Description Logic?***

1. Instances, individuals and roles
2. Instances, resources and roles
3. Individuals, roles and properties
4. Individuals, resources and properties
5. Individuals, concepts/classes and roles **= TRUE**

***Task 9.2***

***An interpretation in Description Logic is defined by means of a domain D and an interpretation function I. How are roles interpreted?***

1. Roles are mapped onto binary relations over D **= TRUE**
2. Roles are mapped onto elements of D
3. Roles are mapped onto subsets over D
4. Roles are mapped onto triples of elements of D

***Task 9.3***

***What is the interpretation of the following DL statement?***

|  |
| --- |
| (Student  Happy)  hasGrad.TopGrade  hasParent.Rich |

|  |
| --- |
| *A happy student has either only top grades (though may not have any grades at all) or has at least one rich parent.* |

**Part 10 Query Languages**

***Assume the following RDFS database:***

|  |
| --- |
| @prefix ex: < <http://someurispecification>>  ex:i001 ex:club “RealMadrid” ;  ex:victories 9 .  ex:i002 ex:club “Barcelona” ;  ex:striker ex:s001 ;  ex:victories 4 .  ex:i003 ex:club “BayernMunich” ;  ex:victories 4 ;  ex:striker ex:s002 ;  ex:striker ex:s003 .  ex:s001 ex:name “Messi” ; ex:goals 8 .  ex:s002 ex:name “Robben” ; ex:goals 3 .  ex:s003 ex:name “Müller” . |

***Task 10.1***

***What is the result of the following SPARQL query:***

|  |
| --- |
| PREFIX ex: < <http://someurispecification>>  SELECT ?a  WHERE {?c ex:club ?a .  ?c ex:victories ?v .  FILTER (?v<4)  } |

|  |
| --- |
| *a*  *(no results)* |

***Task 10.2***

***What is the result of the following SPARQL query:***

|  |
| --- |
| PREFIX ex: < <http://someurispecification>>  SELECT ?s ?g  WHERE {?c ex:club ?s . ?c ex:striker ?t . ?t ex:goals ?g } |

|  |
| --- |
| *s g*  *“RealMadrid” “8”*  *“Barcelona” “3”* |

***Task 10.3***

***Write a SPARQL query that checks if Bayern Munich has a striker that has scored more than 5 goals***

|  |
| --- |
| PREFIX ex: < <http://someurispecification>>  ASK {?s ex:club “BayernMunich” .  ?s ex:striker ?p .  ?p ex:goals ?g .  FILTER (?g > 5)  } |

***Task 10.4***

***Write a SPARQL query that lists the football clubs as well as their strikers, if any.***

|  |
| --- |
| PREFIX ex: < <http://someurispecification>>  SELECT ?c ?p  WHERE {?s ex:club ?c .  OPTIONAL {?s ex:striker ?p}  } |

**Part 11 Ontology Engineering and Quality**

***Task 11.1***

***What does it mean that a class is inconsistent?***

1. The class contains individuals that are also members of other classes
2. The class is interpreted as equivalent to another class in any model
3. There are no instances of the class
4. The existence of the class depends on the existence of another class
5. The class is interpreted as empty in any model **= TRUE**

***Task 11.2***

***Which class is a rigid class?***

1. Animal **= TRUE**
2. Student
3. Customer
4. Child

***Task 11.3***

***Why is this taxonomy not a correct ontology structure?***

|  |
| --- |
| Finger  Hand Hand  Arm Arm  Body  Palm  Hand Joint  Arm Leg  Body  Joint  Leg |

1. Joint cannot be taxonomically linked to both Arm and Leg
2. Both Finger and Palm cannot be taxonomically linked to Hand
3. Fingers and palms are individuals, not classes
4. None of these relationships are subclass relationships **= TRUE**