Mockup exam
in the subjects
Programming & Technology

All written materials, computers, laptops and Internet resources are permitted for the exam.

Cell phones and communication of any kind with other people, except examiners and external examiner is not allowed.

The examination lasts 4 hours and is followed by a 1-hour evaluation. During these time periods, the student may only leave the examination room for visiting the toilet. (During this mock up exam you only have time between 8:20 and 12:00 – feedback is given afterwards)

The exam consists of 6 assignments.
In addition to these assignments, you may be asked to answer some additional questions about your answers and any other choice.

Make sure that this exam paper contains 3 pages including the front page.

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Temperature converter

In this exam you should work with WCF services, TCP and UDP.
This exam is about to convert one temperature to another temperature scale using three different technologies.

Domain description
The temperature in Denmark is measured in Celsius whereas the temperature in the US is measured in Fahrenheit.
A Celsius temperature tempC, can be converted to Fahrenheit, tempF, according to the following formula:

$$tempC = (tempF - 32) /1.8$$

A Fahrenheit temperature tempF, can be converted to Celsius, tempC, according to the following formula:

$$tempF = 1.8 \text{ x } tempC + 32$$

Assignment 1: WCF Service provider

a. Make a *Cloud* Service Application project with a simple WCF service, Service1, which offers the following methods:

> • double GetCelsius (int tempF)
> Returns a Celsius temperature calculated from the Fahrenheit temperature parameter tempF.
>
> • double GetFahrenheit (int tempC)
> Returns a Fahrenheit temperature bergnet from Celsius temperature

b. Use WcfTestClient (Azure emulator) to execute the service locally and test the methods.

c. Which application protocols is used ?
    Show and explain the SOAP messages send/received in *request* and *request*.

Assignment 2: WCF Service consumer

a. Make a simple Console Application project that can use (consume) WCF service, Service1.

b. Show how it can display:

> • A conversion of Celsius to Fahrenheit
> • A conversion of Fahrenheit to Celsius

Assignment 3: WCF Service Azure

a. Publish the SOAP web service in Azure and verify it works.

Instead of using SOAP, you must now set up a TCP server, which can offer the same calculations using a user-defined protocol. The protocol must be used to differentiate between the temperature conversion desired (Celsius to Fahrenheit and vice versa).

Assignment 4: TCP Server

a. Consider and design your very simple protocol.
How to distinguish between Celsius to Fahrenheit vs.. Fahrenheit to Celsius messages?

b. Create a simple Console project using TcpListener and TcpClient sockets, and is listening on a port for example 9999.

c. Expand the program to:

• Read a message from the client and print this message.
• Interpret the message (your protocol) and calculate the desired temperature.
• Send the calculated temperature back to the client

Assignment 5: TCP Client

a. Make a simple Console project that can connect to TCP server and can send temperature messages to TCP server according to your specified protocol.

b. Send message, receive and print server reply of the temperature conversion.

c. What are the advantages of TCP vs.UDP ?
What are the differences between a TCP segment and a UDP segment?

Assignment 6: UDP Server

a. Make a simple Console project based on UDP offering the same temperature calculations.

b. Test your UDP server e.g. by using sockettest (http://sockettest.sourceforge.net/)