Roll No: ----------

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2017

Program: B.Tech (CS-OGI) **Semester – : V**
Subject (Course): Telemetry & SCADA System **Max. Marks : 100**
Course Code : CSED302 **Duration : 3 Hrs**
No. of page/s: 3

Answer all the questions. [4x5=20]

1. What are the different types of antenna?
2. What are the different application areas of Telemetry?
3. Why do you think Sound waves are used under water instead of Radio waves for identification and ranging of objects?
4. What are the different communication channels for unguided medium?

Section B

Answer any six questions. [6x10=60]

5. Compare the merits and demerits of DCS.
6. Differentiate between antenna and communication line.
7. Explain with diagram the components of PLC and its working.
8. Explain the working principle of GPS and its importance in GIS.
9. Represent and explain the SCADA generic software architecture.
10. Explain any two network topologies used in SCADA System.
11. What are the five types of propagation modes in antenna?

Section C

Answer all the questions. [2x10=20]

Refining the Crude Oil Process with Ignition

The Company

Every single day, gas, diesel, and petrol are used around the world to keep vehicles running. Through a process called "fractionation," crude, unprocessed oil is separated into these important fuels. An entire facility is needed to carry out the fractionation process. Enerchem International Inc., a leader in the production and distribution of hydrocarbon drilling and fracturing fluids, runs one such facility at Slave Lake in Alberta, Canada. To efficiently handle the daunting task of maintaining and controlling this facility, Enerchem uses a flexible HMI, SCADA, and MES software platform called Ignition by Inductive Automation.®

The fractionation process begins when raw crude oil comes into the facility from the tank trucks, and goes through a series of preheats into the big crude furnace. The crude oil is super-heated, then moved into the fractionation tower. In the tower, crude oil is separated out into three main byproducts – base oil, fracturing fluid, and wax solvents – which are then collected. All of the oil products are processed and maintained by very tight controls, provided by the Ignition system, that maximize the yield that the facility gains from the crude oil process.

The Challenge

Before using Ignition, Enerchem's Slave Lake fractionation plant was using an outmoded HMI system that required a lot of attention from the personnel. "With previous HMIs we've used in the past, we had to have two to three operators on each panel to be able to control it," says Kevin Bouchard, director of plants and terminals for Enerchem.

"The existing system that was in place had a lot of flaws," says Kyle Chase, CEO of Kymera Systems. With over 25 years of combined experience, Kymera Systems is a Canada-based systems integrator that primarily serves the oil and gas industries of Western Canada, and also works in the water, waste water, manufacturing, and asphalt industries in Alberta. "It was reporting using a different vendor's package, it was exporting to a very primitive database, and all the reports were made up in Excel. It wasn't very manageable or accessible," says Chase.

With just over 30,000 tags, the fractionation plant was in need of an HMI/SCADA system that could allow them to manage the entire facility with precise controls and with a far higher level of efficiency.

The Strategy

Taking full advantage of Ignition and its built-in, cross- platform OPC-UA server, Chase and his Kymera Systems integration team helped Enerchem build a cost-effective system that has increased the efficiency of the plant's processes. The Kymera Systems team started out by taking Enerchem's old system, which lacked the accessibility and manageability that the plant needed, and introducing Ignition. With Ignition's flexible Java-based platform, Kymera Systems was able to customize Enerchem's system to fit their needs. They implemented a database, which boosted the ease of use for all of the operators and allowed easy access to years and years of data produced by the facility.

Through the use of an OPC-UA server, Ignition is able to easily connect with multiple control networks, such as Ethernet/IP and Modbus. Ignition also acts as an OPC-UA client, connecting to many PLCs at the plant which have an embedded OPC-UA server. All of Enerchem's facilities are connected through OPC-UA , sharing live plant information between them.
Kymera Systems also set up remote access, as well as individual user accounts. All of these helped to organize the plant and increase the efficiency of the operators. By providing greater access to data, the plant could get more done using a smaller number of people.

The Results
The Enerchem Slave Lake facility has now used Ignition for five years. The software has increased efficiency at the plant and helps the operators accomplish more. One operator can control 10 to 15 different processes at a time, instead of having two to three operators on an HMI panel, reducing labor costs and boosting work output.
Ignition has also helped the plant become more successful by giving operators more power to reduce waste and manage the fractionation process. Bouchard says, "With real-time remote access and trending capabilities, the overall efficiency of the yield of the product as compared to the crude we consume is much better. Ignition has been an economical and profitable system for us."
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Question:

12. Critically analyze the strategy of solving the issues used in the above case. What improvements would you like to implement, if any.
13. What do you think were the software design parameters implemented in the above case?

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Answer all the questions. [4x5=20]

1. What is the working principle of antenna?
2. What is PLC?
3. Differentiate between LEO & GEO satellites.
4. What is distributed Database?

Section B

Answer any six questions. [6x10=60]

5. Explain in detail the difference between Distributed computing system and SCADA system.
6. Differentiate between Slot & INF antenna.
7. What are the principles of Radiated EM fields?
8. Explain in detail the special features of PLC.
9. Identify the software architecture of SCADA system.
10. Identify the different functions of SCADA System.
11. What are the five types of propagation modes in antenna?

Section C

Answer all the questions. [2x10=20]

Bedrock Automation helps City of Lynchburg, Virginia enhance control of wastewater treatment operations

September 19, 2017 – Bedrock Automation announced today that the City of Lynchburg, Virginia has selected the Bedrock control system for its wastewater treatment operations. The City implemented Bedrock to control both de-chlorination and storm water remediation operations, and is planning other integration and control applications as part of its ongoing modernization program. Systems integration firm Instrulogic of North Carolina provided programming support to help deploy and integrate the system with the City's Inductive Automation Ignition SCADA HMI network.

"We want to transform from a centralized to a distributed approach using edge controller capabilities. Bedrock enables us to use remote monitoring, bringing many devices online into our SCADA system for the first time," said Jason Hamlin, SCADA Manager, City of Lynchburg.

The Lynchburg Regional Wastewater Treatment Plant treats an average of 13 million gallons a day for Lynchburg and surrounding communities. The first two phases of its modernization initiative include automation of the residual chlorine removal process and the mitigation and notification of storm water overflows.

The Bedrock platform supplied Lynchburg with an affordable alternative for transforming a complex, aging, and connectivity-challenged de-chlorination system. It also proved the most effective approach to address their storm water collection and alert-compliance issues.

"Providing public access to the existing scanner/alarm in the current environment meant opening access to the SCADA system, which we could not do. Bedrock's cyber security allows us to confidently monitor overflows and feed data to the Ignition SCADA system, while providing public notifications," said Hamlin.

According to Hamlin, a key to Bedrock's flexibility is its modern and free Integrated Development Platform (IDE). The ability to switch over to Bedrock without interrupting treatment operations is facilitated by the embedded simulation capabilities that ensure a solution is fully tested before deployment.

Lynchburg continues to find new opportunities to leverage Bedrock's breadth of capabilities. The team is currently evaluating a request to connect the Ignition SCADA system to the city's business network for secure administrative and reporting, and the Bedrock system would

simplify data collection. “I could probably run the whole plant with one controller if I wanted to. I can also monitor much more than with my previous vendor, across multiple protocols and with no additional system cost,” said Hamlin.

Question:

12. Critically analyze the strategy of solving the issues used in the above case. What improvements would you like to implement, if any.
13. What do you think were the software design parameters implemented in the above case?

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