Name: **Enrolment No:**	UPES UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2019

Course: Telemetry & SCADA **Semester: VI**
Program: B.Tech. CS-OGI **Time 03 hrs.**
Course Code: CSEG302 **Max. Marks: 100**
Instructions: **All sections are compulsory** **Nos. of page(s) : 2**

SECTION A

S. No.	Write short notes on the following	Marks	CO
Q 1	Explain the properties of DCS	4	CO1
Q 2	Differentiate between guided and unguided transmission medium	4	CO2
Q 3	Identify the different types of antenna	4	CO3
Q 4	Identify the different PLC components	4	CO3
Q 5	Explain Polarization in antenna.	4	CO4

SECTION B

	All questions are compulsory	Marks	CO
Q 6	Differentiate between intended and unintended radiations	10	CO4
Q 7	Differentiate between antenna and transmission line	10	CO3
Q 8	Identify and explain the communication components of a PLC system	10	CO3
Q 9	Represent and explain the SCADA generic software architecture **OR** Explain any two network topologies used in SCADA System	10	CO5

SECTION-C

	Case Study	Marks	CO
	The oil & gas (O&G) industry is under constant pressure due to fluctuating commodity prices, shifting regulatory policies, antagonistic political pressure and other factors. In recent years, O&G companies have also had to contend with volatile commodity prices, a shrinking pool of experienced workers, and shareholder demands for increased profitability. To navigate and prosper under these conditions, leading O&G operators are focusing on technological advancements and modernizations to solve operational issues and sustain profits. The Challenge: Innovate or Die Because of the ever-changing business environment, O&G operators can no		

	longer thrive, or even survive, by relying solely on yesterday's technologies. They must reinvent themselves to be competitive within the marketplace and remain attractive to investors. Wall Street knows this and has connected the dots in terms of recognizing and rewarding firms adopting new technologies to gain a competitive edge. Specific to the O&G industry, investors are keenly aware of innovative methods enabling operators to reduce capital (CAPEX) and operating (OPEX) expenses, increase production and optimize the supply chain. For example, according to Goldman Sachs' recent O&G report entitled, *Shale Innovation: Brawn to Brains to Bytes, "*after initially relying on 'brawn' and 'brains' to improve well productivity, the oilfield is now shifting its focus to 'bytes' (Figure 1). Big data analytics, artificial intelligence (AI) and machine learning (ML) are at the forefront of several E&Ps' and service providers' minds as they look to not only improve well productivity, but also lower CAPEX and OPEX through better and faster decision-making, more reliable equipment, less human intervention, etc." O&G executives are taking this message to heart. "We have to disrupt ourselves," said Tim Dove, chief executive officer of Pioneer Natural Resources at a recent industry conference. "That is why transformation must be driven from the top down." The challenge for O&G companies seeking new technologies and solutions is the answers are not always found in the larger services companies. Instead, smaller and more agile startup firms often provide better solutions because they are typically quicker to market with innovations—especially in big data, AI and ML. Often these innovative firms can be hard for O&G companies to identify, and even when found, O&G companies can be hesitant to work with unestablished firms on what can be mission critical projects. At the same time, many startups do not have the deep connections required to establish credibility with O&G companies. The O&G companies are increasingly aware of this disconnect between leading-edge ideas and their access to them, which can result in an "innovation gap" in their technology portfolio. Just as operator companies often shy away from working with smaller innovative firms, these firms often lack all the tools, resources and customer guidance required to move from great ideas to vetted products, and eventually to sales.		
Q 10	Compare the different other technologies which could have be used in the above scenario to resolve the challenges.	**20**	**CO5**
Q 11	Critically analyze the technological challenges in the above scenario. OR Design a detailed Telemetry and SCADA architecture for the above scenario.	**20**	**CO5**

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SECTION A

S. No.	Write short notes on the following	Marks	CO
Q 1	Identify the different antenna performance criteria.	**4**	**CO1**
Q 2	Identify the different propagation modes	**4**	**CO2**
Q 3	Explain Maximum Useable Frequency (MUF)	**4**	**CO3**
Q 4	Explain Antenna Gain	**4**	**CO3**
Q 5	Explain the Block diagram of a PLC	**4**	**CO4**

SECTION B

	All questions are compulsory	Marks	CO
Q 6	Explain the SCADA Architecture	**10**	**CO4**
Q 7	Identify and explain the software components of a SCADA System	**10**	**CO3**
Q 8	Explain the principals of Radiated Electromagnetic Fields	**10**	**CO3**
Q 9	Differentiate between DCS & SCADA **OR** Identify & Explain the different functionalities of SCADA System	**10**	**CO5**

SECTION-C

	Case Study	Marks	CO
	In 2010, Trenton and Amalga, two northern Utah towns separated by only a few miles, created a plan to design and build an interconnection between their two municipal water systems. The interconnect system would automatically allow water from Trenton to flow to Amalga and vice versa, allowing the two towns to share water during emergency situations. To accomplish this, the towns worked with JUB Engineers of Logan, who contracted with Intermountain Environmental (IEI), also of Logan, to install a supervisory control and data-acquisition (SCADA) system to allow each town to view the status of their water system and control the interconnect system as needed. Each town has separate water sources, pump tanks, and distribution systems, so the challenge was to connect them in a way that would easily allow sharing of water.		

	Intermountain Environmental used the CR1000 Measurement and Control System (manufactured by Campbell Scientific) and VTScada software (by Trihedral) as the foundation for the SCADA system. The outcome was independent systems in each town. The systems connect with numerous sensors via a Campbell multiplexer to monitor parameters such as flow and pressure from water sources into tanks, flow and pressure from tanks into the towns, tank level, and flood conditions at the building housing the system. The CR1000 uses a Campbell SDM-CD8S dc device controller to control pumps and valves, with each town controlling the valves to allow or disallow the water flowing to the other. VTScada allows the town water managers to view the status of pumps, water levels, and door and hatch alarms. The software can send out alarms, and allows users to access their system information and control devices over the Internet as if they were sitting at the main PC at the town hall. Each town received similar equipment and the systems are independent of each other. The CR1000 was used as a remote terminal unit (RTU) at each site and also as the programmable logic controller (PLC) at each base station. The dataloggers communicate with each other using Campbell's RF450 spread-spectrum radio. At each town hall there is a master station that consists of a CR1000 and an NL120 Ethernet interface. LoggerNet and VTScada run on Windows 7 PCs and communicate with the CR1000 master unit over Ethernet connections. The system has been in operation since May of 2011.		
Q 10	Compare the different other technologies which could have be used in the above scenario to resolve the challenges.	**20**	**CO5**
Q 11	Critically analyze the technological challenges in the above scenario. OR Design a detailed Telemetry and SCADA architecture for the above scenario.	**20**	**CO5**