

Name:	
Enrolment No:	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2018

Course: LNG & Storage of Natural Gas (PTEG 465)
Programme: B.Tech. APE Gas
No. of pages: 02

Semester: VII
Time: 3 hrs
Max. Marks: 100

Instruction: Assume suitable data, if necessary.

SECTION A

Q. No.	Answer all questions. [5 X 4 = 20 marks]	Marks	CO
Q. 1	What are the health hazards associated with LNG?	5	CO1
Q. 2	Enlist the factors and models in LNG pricing.	5	CO3
Q. 3	Draw a neat sketch of 'Glycol-water intermediate fluid vaporizer for LNG.'	5	CO4
Q. 4	Give the significance of natural gas storage. Explain the two main storage methods employed.	5	CO5

SECTION B

	Answer all questions. [10 X 4 = 40 marks]		
Q. 5	Give the advantages and areas of concern of 'Black & Veatch - Pritchard PRICO Process' for LNG production.	10	CO1
Q. 6	Discuss 'Technigaz' and 'Gaz Transport' tank designs used in LNG carriers.	10	CO2
Q. 7	Explain LNG pricing conceptualization with respect to pricing formula, straight line approach and ceiling and floor approach. Figures are necessary.	10	CO3
Q. 8	Air is compressed from 1 bar and 290 K to 10 bar through isentropic compression with 90% efficiency. Estimate the energy required in MW to compress 10000 kg/h of air. Data for Q.8 Enthalpy of air at 1 bar (H_1) = 4500 cal/mol Enthalpy of air at 10 bar (H_2) = 6200 cal/mol (isentropic path) Average molecular weight of air = 29 g/mol	10	CO4

SECTION-C

	Q.9 is compulsory. Out of Q.10 & 11 answer any one. [20 X 2 = 40 marks]		
Q. 9	Describe with flow diagram, 'Black & Veatch - Pritchard PRICO Process' for LNG production.	20	CO1
Q. 10	Describe with flow diagram, 'Power Plant with LNG Cold Energy Utilization'.	20	CO4

<p>Q. 11</p>	<p>Open rack vaporizer is being used for regasification of LNG entering at $-161.5\text{ }^{\circ}\text{C}$ to RLNG leaving at $0\text{ }^{\circ}\text{C}$. Sea water is being used as heating medium entering at $35\text{ }^{\circ}\text{C}$ and leaving at $5\text{ }^{\circ}\text{C}$. Overall heat transfer coefficient based on outer tube surface is $50000\text{ W/m}^{\circ}\text{C}$. Calculate surface area and total number of tubes required for following cases. Comment on your answers.</p> <p>Case 1: Tube length = 4 m Case 2: Tube length = 8 m Case 3: Tube length = 12 m</p> <p>Data for Q.11 Tube OD = 20 mm Type of flow = countercurrent LMTD correction factor = 1 Flow rate of sea water = $24000\text{ m}^3/\text{hr}$ Density of sea water = 1.03 g/ml Specific heat of sea water = $3850\text{ J}/(\text{kg }^{\circ}\text{C})$</p>	<p>20</p>	<p>CO4</p>
---------------------	--	------------------	-------------------