Name: **Enrolment No:**	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2022

Course: LNG & Storage of Natural Gas **Semester : VII**
Program: B.Tech. APE Gas **Time : 03 hrs.**
Course Code: CHGS4005 **Max. Marks: 100**
No of pages: 02
Instructions: Assume suitable data, if necessary.

SECTION A
(5Qx4M=20Marks)

S. No.	Short answer type questions.	Marks	CO
Q 1	Recall and write the applications of RLNG both as feedstock and fuel.	4	CO1
Q 2	Remember and list the materials for the storage tanks on LNG carriers according to Techni Gaz Tank design concept.	4	CO2
Q 3	Discuss the navigational aids used at the LNG regasification terminal.	4	CO3
Q 4	List two merits and two demerits of a submerged combustion vaporizer (SCV) for LNG.	4	CO4
Q 5	Draw a neat sketch of, 'Natural Gas Storage in an Aquifer'. (A well labelled sketch is expected.)	4	CO5

SECTION B
(4Qx10M= 40 Marks)

S. No.	Medium answer type questions.	Marks	CO
Q 6	Illustrate with neat sketch, 'Single Containment LNG Storage Tank'. (Both diagram and description are expected.)	10	CO2
Q 7	Explain the guidelines for LNG contract negotiations in respect of 'Shipping and Transportation' and 'Take or Pay Liability'.	10	CO3
Q 8	Describe with diagram, the construction and working of a 'Glycol-Water Intermediate Fluid Vaporizer' for LNG.	10	CO4
Q 9	Analyze and describe 'Salt Caverns' as one of the methods for the storage of natural gas. (Diagram is not expected.) **OR** Analyze and describe 'Aquifers' as one of the methods for the storage of natural gas. (Diagram is not expected.)	10	CO5

SECTION-C (2Qx20M=40 Marks)			
S. No.	**Long answer type questions.**	**Marks**	**CO**
Q 10	Illustrate with flow diagram, 'Black & Veatch-Pritchard PRICO Process' for LNG production. (Only process description and flow diagram are expected). **OR** Analyze and describe the major components of LNG liquefaction plant.	**20**	**CO1**
Q 11	Open rack vaporizer (ORV) is being used for regasification of LNG entering at -161.5 ^{o}C to RLNG leaving at 0 ^{o}C. Sea water is being used as heating medium entering at 30 ^{o}C and leaving at 5 ^{o}C. Overall heat transfer coefficient based on outer tube surface is 50000 W/(m^2K). Calculate surface area and total number of tubes required for following two cases: Case 1: Tube length = 4 m Case 2: Tube length = 12 m Use following data: **Data for Q 11** • Tube OD = 20 mm • Type of flow = countercurrent • LMTD correction factor = 0.9 • Flow rate of sea water = 24000 m^3/hr • Density of sea water = 1.03 g/ml • Specific heat of sea water = 3850 J/kg K	**20**	**CO4**