

Name:

Enrolment No:



UPES

End Term Examination – May 2025

Program: B. Tech APE
Course: Natural Gas Engineering
Code: CHCE 2024
Assume data if necessary

Semester: IV
Time: 03 hrs.
Max Marks :100

SECTION A (5Qx4=20)

S. No.	Short Notes	Marks	CO
1	List applications of phase diagram.	4	CO2
2	What are factors affecting the design of separators?	4	CO2
3	Define attributes of gas flow meters.	4	CO3
4	Differentiate between Associated gas & Non-Associated Gas	4	CO1
5	Explain phase diagram for variable composition	4	CO2

SECTION B (4Qx10=40)

6	With a neat sketch explain ultrasonic meter in detail.	10	CO3														
7	With the help of phase diagram for multicomponent system explain the application in ‘Design of Hydrocarbon Production & Separation System’.	10	CO2														
8	<div>Calculate Apparent molecular weight, Gas Gravity and pseudocritical properties of Natural Gas from following composition</div> <table><tr><th>Component</th><th>Mole Fraction (y)</th></tr><tr><td>C1</td><td>0.9</td></tr><tr><td>C2</td><td>0.05</td></tr><tr><td>C3</td><td>0.02</td></tr><tr><td>N2</td><td>0.013</td></tr><tr><td>CO2</td><td>0.016</td></tr><tr><td>H2S</td><td>0.001</td></tr></table> <div>$T_{pc} = 170.491 + 307.344 G$$P_{pc} = 709.604 - 58.718 G$</div>	Component	Mole Fraction (y)	C1	0.9	C2	0.05	C3	0.02	N2	0.013	CO2	0.016	H2S	0.001	10	CO1
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9	Explain diaphragm meter for gas measurement in detail.	10	CO3
SECTION-C (2Qx20=40)			
10	Calculate the compressor horsepower required for an adiabatic compression of 10^6 MMSCFD gas with an inlet temperature of 68°F and 750 psig pressure. The discharge pressure is 1350 psig. Assume the compressibility factors at suction and discharge conditions to be $Z_1 = 1.0$ and $Z_2 = 0.80$, respectively, and the adiabatic exponent = 1.45, with the adiabatic efficiency = 0.85. If the mechanical efficiency of the compressor driver is 0.95, what BHP is required? Calculate the outlet temperature of the gas.	20	CO4
11	Design Vertical Separator and Horizontal Separator with mist extractor for Oil and Gas separators for following operating conditions 1. Gas flow rate: 5.2 MMSCFD 2. Gas-specific gravity: 0.65 3. GOR: 60 bbl/MMSCF 4. Oil gravity: 60 °API 5. Operating pressure: 800 psig 6. Operating temperature: 80 °F 7. Retention Time = 2 min 8. Compressibility Factor = 0.9 Use basic relationships for this design	20	CO4