

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION SP2023)

CLASS: B. TECH
BRANCH: CHEMICAL/CHEMICAL P&P

SEMESTER : VI
SESSION : SP2023

SUBJECT: CL330 NATURAL GAS ENGINEERING

TIME: 02 Hours

FULL MARKS: 25

INSTRUCTIONS:

1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates

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| Q.1(a) Write the name of the methods for transporting natural gas from its origin to the existing markets. [2] | 1 | 1 | |
| Q.1(b) Define the following terms: (i) Reservoir, (ii) Field, and (iii) Pool [3] | 1 | 1 | |
| Q.1(c) For the gas composition given below, determine apparent molecular weight, specific gravity, pseudocritical pressure, and pseudo-critical temperature of the gas. [5] | 1 | 3 | |

Component	Mole fraction	T _{ci} (°R)	P _{ci} (psia)
CH ₄	0.765	344	673
C ₂ H ₆	0.073	550	709
C ₃ H ₈	0.021	666	618
i-C ₄ H ₁₀	0.005	733	530
n-C ₅ H ₁₂	0.006	847	485
N ₂	0.060	492	227
CO ₂	0.040	548	1073
H ₂ S	0.030	1306	672

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| Q.2(a) Define absolute and effective porosity of a rock material. [2] | 2 | 1 | |
| Q.2(b) Define the following terms: (i) absolute permeability, (ii) Effective permeability, and (iii) Relative permeability. [3] | 2 | 1 | |
| Q.2(c) Prove the following relationship for the gas flow in a tube using first law of thermodynamics and with appropriate assumptions. [5] | 2 | 3 | |

$$\frac{zRT}{29\gamma_g} \frac{dP}{P} + \left\{ \frac{g}{g_c} \cos\theta + \frac{8f Q_{sc}^2 P_{sc}^2}{\pi^2 g_c D_i^5 T_{sc}^2} \left[\frac{zT}{P} \right]^2 \right\} dL = 0$$

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| Q.3 Draw a neat schematic diagram of various processes of a gas processing plant. Write at least three roles of a gas processing plant. [5] | 3 | 1 | |
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