Name: **Enrolment No:**	

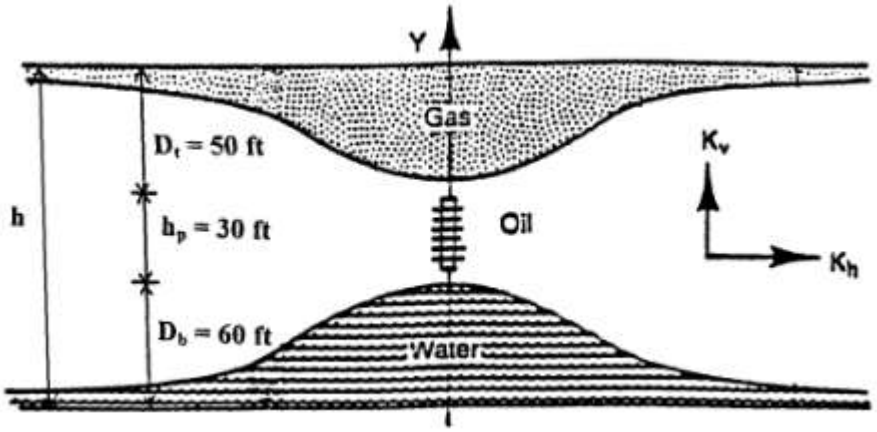
UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2022

Course: Reservoir Engineering II **Semester: V**
Program: B.Tech APE GAS **Time : 03 hrs.**
Course Code: PEAU 3005 **Max. Marks: 100**

Instructions:
All Questions are Compulsory.
Use the below graphs for any data.

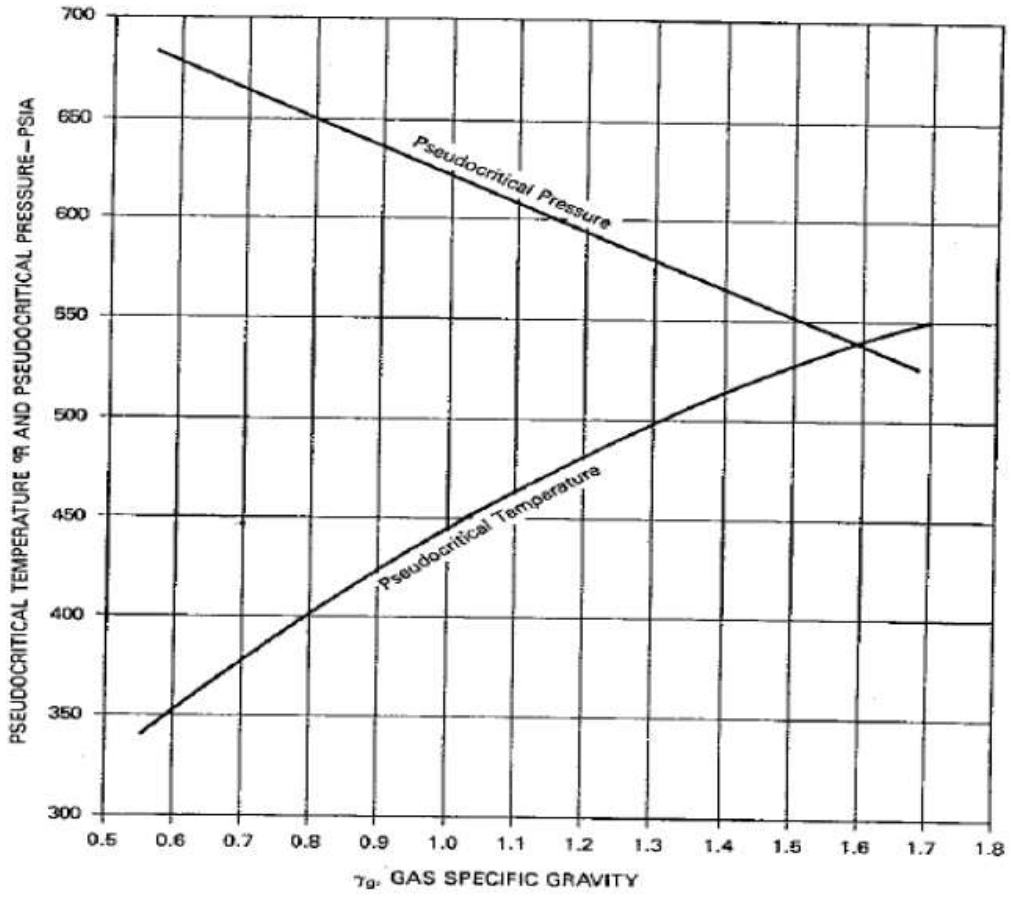
SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	List the expressions and the importance of predicting future production rates by i. Exponential decline analysis ii. Hyperbolic decline analysis	**4M**	**CO3**
Q 2	What is one-dimensional displacement in enhancing the oil recovery?	**4M**	**CO2**
Q 3	Differentiate between finite and infinite aquifer?	**4M**	**CO1**
Q 4	List out the limitation of Volumetric Analysis in estimating the hydrocarbon in place?	**4M**	**CO3**
Q 5	Define coning and mobility ratio and mention the significance of mobility ratio in coning?	**4M**	**CO4**
	SECTION B **(4Qx10M= 40 Marks)**		
Q 1	Calculate the water influx after 100, 200, 400 and 800 days into a reservoir the boundary pressure of which is suddenly lowered and held at 2724 psia from the initial pressure of 2734 psia. $\emptyset = 0.2, k = 83\ md, C_t = 8 * 10^{-6} psi^{-1}, r_o = 3000\ ft$ $\mu = 0.62\ cp, \theta = 360^o, h = 40\ ft\ , r_e = 30{,}000\ ft.$	**10M**	**CO1**
Q 2	a) Calculate initial oil in place in a volumetric, under-saturated reservoir. **(5 Marks)** Given data: B*ti* = 1.35469 bbl/STB B*t* at 3600 psig = 1.37500 bbl/STB Connate water = 0.20 Cw = 3.6 * 10-6 psi-1	**5 M+ 5 M**	**CO3**

	Bw at 3600 psig = 1.04 bbl/STB cf = 5.0 * 10-6 psi-1 pi = 5000 psig Np = 1.25 MM STB $\Delta\bar{p}$ at 3600 psig = 1400 psi Wp = 32000 STB We = 0. b) The gas filed is produced under a water drive such that the pressure stabilizes at 1350 psi. If the residual gas saturation is 22% and the gas formation volume factor at 1350 psi is 0.02145 cu.ft/SCF. Calculate the unit recovery and recovery factor? (Assume the required data). **(5 Marks)**		
Q 3	Calculate the initial gas in place and the initial reserve of a gas reservoir from pressure – production data for a volumetric reservoir. Given Base pressure =15.025 psia. Initial Pressure = 3250 psia Reservoir Temperature = 213^o F. Standard Pressure = 15.025 psia. Standard Temperature = 60^o F. Cumulative Production = 1.00 * 10^9 SCF. Average reservoir Pressure = 2864 psia Gas deviation factor at 3250 psia = 0.910 Gas deviation factor at 2864 psia = 0.888 Gas deviation factor at 500 psia = 0.951	**10M**	**CO3**
Q 4	A vertical well is drilled in an oil reservoir that is overlaid by a gas cap and under laid by bottom water. Figure shows an illustration of the Simultaneous gas and water coning.  The following data are available: oil density, r_o = 47.5 lb/ft3 water density, r_w = 63.76 lb/ft3 gas density, r_g = 5.1 lb/ft3 oil viscosity, μ_o = 0.73 cp oil FVF, B_o = 1.1 bbl/STB	**5 M+ 5 M**	**CO4**

	oil column thickness, h = 65 ft depth from GOC to top of perforations, Dt = 25 ft well perforated interval, h_p = 15 ft wellbore radius, r_w = 0.25 ft drainage radius, r_e = 660 ft oil effective permeability, k_o = 93.5 md horizontal and vertical permeability, i.e., k_h, k_v = 110 md oil relative permeability k_{ro} = 0.85 a) Calculate the maximum permissible oil rate that can be imposed to avoid cones breakthrough, i.e., water and gas coning (5 Marks) b) Calculate the optimum distance for the placement of the 15-foot perforations. (5 Marks)		
SECTION-C (2Qx20M=40 Marks)			
Q 1	a) Derive an expression for production 'q' bbl at time't' from well initially producing 'qi' bbl of oil by exponential decline analysis. (10 Marks) b) Given that a well has declined from 100 stb/day to 96 stb/day during a one-month period, identify a suitable decline model, determine model parameters, and project production rate until a marginal rate of 25 stb/day is reached. (10 Marks) **(OR)** a) Discuss different type of decline curve analysis and explain the applicability of each curve type? (10 Marks) b) Given that, a well has declined from 100 stb/day to 96 stb/day during a one-month period. Use the exponential decline model to perform the following tests: 1. Predict the production rate performance after 11 months. 2. Calculate the amount of oil produced during the first year. 3. Project the yearly production from the well for the next 5 years (10 Marks)	**10 M + 10 M**	**CO3**
Q 2	Calculate the initial oil and gas in place per acre – foot for a gas condensate reservoir. Given: Initial Pressure = 2740 psia Reservoir Temperature = 215°F Average Porosity = 25% Average Connate Water Saturation = 30% Daily tank oil = 242 STB Oil Gravity, 60°F = 48.0° API Daily Separator Gas = 3100 MCF. Separator gas gravity = 0.650 Daily tank gas = 120 MCF Tank gas gravity = 1.20	**20 M**	**CO4**

Graph 1: Pseudocritical Properties of Natural Gas



Graph 2: Compressibility factors of natural gases