Name: **Enrolment No:**	UPES UNIVERSITY OF TOMORROW

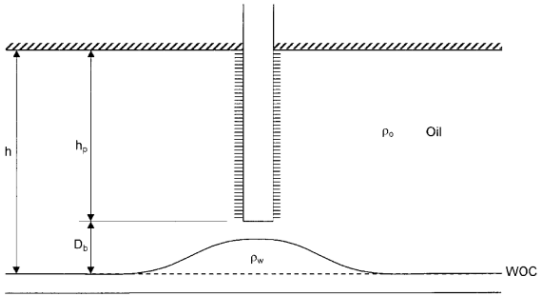
UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, Dec 2023

Course : Reservoir Engineering - II
Programme : BTech (APE GAS)
Course Code : PEAU 3005
Nos. of page(s) : 2

Semester : V
Time : 3hr
Max. Marks : 100

Instructions: *Assume any data missing*
Attach any graph or datasheet used

SNo	SECTION A (5X4=20 Marks)	Marks	CO
Q 1	Define a volumetric reservoir.	**4**	**CO1**
Q 2	Define effective fluid compressibility, *Ce*.	**4**	**CO1**
Q 3	Define abnormal-pressure gas reservoirs.	**4**	**CO2**
Q 4	Define economic limit production rate and list the variables included in its estimation.	**4**	**CO3**
Q 5	Mention the significance of the Buckley-Leverett equation.	**4**	**CO4**
	SECTION B (4*10=40 Marks)		
Q 6	Calculate original oil in place and hence the recovery factor in a volumetric, under-saturated reservoir at abobe bubble point form the following data at 3600 psi: P_i - 5000 psi; B_{ti} -1.355 RB/STB; B_t at 3600 psi - 1.375 RB/STB; N_p - 1.25 MM STB; Connate water saturation - 0.2; B_w at 3600 - 1.04 RB/STB; W_p - 32,000 STB; W_e - 0; c_w - 3.6 * 10^{-6} psi^{-1}; c_f - 5.0 * 10^{-6} psi^{-1}.	**10**	**CO1**
Q 7	A gas well producing from the Devonian formation in Ward County, Texas, is tested periodically and the following data is collected: P_R (psi): 5608 | 4910 | 4537 | 4055 | 3631 Z: 1.0045 | 0.9705 | 0.9525 | 0.9300 | 0.9102 **Gp (MCF)**: 144,941 | 2,282,721 | 5,338,601 | 9,989,696 | 13,443,654 Calculate the original gas-in-place.	**10**	**CO2**
Q 8	Derive an expression for maximum possible oil flow rate through a well, which penetrates a depth 'D_t' into a oil zone of thickness 'h' during water coning. 	**10**	**CO3**
Q 9	Following is the data of immiscible displacement in a reservoir of 200m X 200m pattern: Porosity – 20%; oil saturation – 65%; residual oil saturation – 25%; mobility ratio – 1.32; pay thickness – 5 zones of 1 m each; permeability of zones – 310, 187, 432, 187 and 64 md. Calculate: a. Fractional flow of water b. Oil recovery by stile's method if the water break through is in 2rd layer	**10**	**CO4**

<table>
<tr><th colspan="5">SECTION C (2*20=40 Marks)</th></tr>
<tr><td>Q10</td><td>a. Derive an expression for production ‘q’ bbl at time ‘t’ from well initially producing ‘q_i’ bbl of oil by exponential decline analysis.
b. Following is the oil production data recorded from well opened in Jan 2015.
<table>
<tr><td>Month</td><td>Jan</td><td>Jul</td><td>Dec</td><td>Jul</td><td>Jan</td><td>Jul</td><td>Feb</td><td>Jun</td><td>Jan</td></tr>
<tr><td>Year</td><td>2015</td><td>2015</td><td>2015</td><td>2016</td><td>2017</td><td>2017</td><td>2018</td><td>2018</td><td>2019</td></tr>
<tr><td>Production (bbl)</td><td>1700</td><td>1511</td><td>1405</td><td>1240</td><td>1100</td><td>1003</td><td>890</td><td>831</td><td>736</td></tr>
</table>
Based on the exponential decline analysis estimate
i. The decline percentage
ii. The production rate in Jan 2020
iii. The cumulative oil production from Jan 2015 through Jan 2020</td><td>20</td><td>CO3</td></tr>
<tr><td>Q11</td><td>a. Derive an expression for velocity of a plane of constant water saturation displacing oil through linear system by Buckley-Leverett approach.
b. Derive an expression for evaluating oil recovery during an immiscible displacement from a stratified reservoir by Stile’s approach.</td><td>20</td><td>CO4</td></tr>
</table>