| Roll No. | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|

# PRESIDENCY UNIVERSITY

## BENGALURU

**Mid - Term Examinations – October 2025**

**Date:** 07-10-2025 **Time:** 09.30am to 11.00am

| | |
|---|---|
| **School:** SOE | **Program:** B.Tech. (PET) |
| **Course Code :** PET3006 | **Course Name:** Advanced Petroleum Reservoir Engineering |
| **Semester**: V | **Max Marks**: 50 / **Weightage**: 25% |

| CO - Levels | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|
| **Marks** | **24** | **26** | **-** | **-** | **-** |

**Instructions:**

*(i) Read all questions carefully and answer accordingly.*

*(ii) Do not write anything on the question paper other than roll number.*

## Part A

**Answer ALL the Questions. Each question carries 2marks.** **5Q x 2M=10M**

| | | | | |
|---|---|---|---|---|
| 1 | List the classification of aquifers based on boundary conditions. | 2 Marks | L1 | CO1 |
| 2 | State the principle of the Schilthuis steady-state water influx model. | 2 Marks | L1 | CO1 |
| 3 | Match the Pot Aquifer model with the Schilthuis model by highlighting differences. | 2 Marks | L1 | CO2 |
| 4 | Recognize how aquifer geometry influences water influx. | 2 Marks | L1 | CO2 |
| 5 | Outline the assumptions made by van Everdingen and Hurst regarding aquifer properties. | 2 Marks | L1 | CO2 |

## Part B

**Answer the Questions.** **Total Marks 40M**

<table>
<tr><td>6.</td><td>a.</td><td>Calculate the cumulative water influx using Pot Aquifer model that results from a pressure drop of 200 psi at the oil-water contact with an encroachment angle of 80°. The reservoir-aquifer system is characterized by the following properties:<br><br>

| | Reservoir | Aquifer |
|---|---|---|
| radius, ft | 2600 | 10,000 |
| porosity | 0.18 | 0.12 |
| $c_f$, $psi^{-1}$ | $4 \times 10^{-6}$ | $3 \times 10^{-6}$ |
| $c_w$, $psi^{-1}$ | $5 \times 10^{-6}$ | $4 \times 10^{-6}$ |
| h, ft | 20 | 25 |

</td><td>10 Marks</td><td>L3</td><td>CO1</td></tr>
<tr><td></td><td>b.</td><td>Use the above data given [Question (6a)] and Calculate Schilthuis' water influx constant.<br><br>Given<br>pi = 3500 psi; p = 3000 psi; Qo = 32,000 STB/day<br>Bo = 1.4 bbl/STB; GOR = 900 scf/STB; Rs = 700 scf/STB<br>Bg = 0.00082 bbl/scf; Qw = 0; Bw = 1.0 bbl/STB</td><td>10 Marks</td><td>L3</td><td>CO1</td></tr>
<tr><td colspan="6" align="center">Or</td></tr>
<tr><td>7.</td><td colspan="2">The pressure history of a water-drive oil reservoir is given below:<br><br>

| t, days | p, psi |
|---|---|
| 0 | 3500 ($p_i$) |
| 100 | 3450 |
| 200 | 3410 |
| 300 | 3380 |
| 400 | 3340 |

The aquifer is under a steady-state flowing condition with an estimated<br>water influx constant of 130 bbl/day/psi. Calculate the cumulative water influx after 100, 200, 300, and 400 days using the steady-state model.</td><td>20 Marks</td><td>L3</td><td>CO1</td></tr>
</table>

<table>
<tr><td>8.</td><td>The following data, as presented by Craft and Hawkins (1959), documents the reservoir pressure as a function of time for a water-drive reservoir. Using the reservoir historical data, Craft and Hawkins</td><td>20 Marks</td><td>L3</td><td>CO2</td></tr>
</table>

| | | | | |
|---|---|---|---|---|
| | calculated the water influx by applying the material balance equation The rate of water influx was also calculated numerically at each time period | | | |

| Time days | Pressure psi | $W_e$ M bbl | $e_w$ bbl/day |
|---|---|---|---|
| 0 | 3793 | 0 | 0 |
| 182.5 | 3774 | 24.8 | 389 |
| 365.0 | 3709 | 172.0 | 1279 |
| 547.5 | 3643 | 480.0 | 2158 |
| 730.0 | 3547 | 978.0 | 3187 |
| 912.5 | 3485 | 1616.0 | 3844 |
| 1095.0 | 3416 | 2388.0 | 4458 |

Assuming that the boundary pressure would drop to 3,379 psi after 1,186.25 days of production, calculate cumulative water influx at that time (Use Hurst's Modified Steady state Model).

**Or**

| | | | | |
|---|---|---|---|---|
| **9.** | Calculate water influx at the end of 1, 2, and 5 years into a circular reservoir with an aquifer of infinite extent. The initial and current reservoir pressures are 2,500 and 2,490 psi, respectively. The reservoir-aquifer system has the following properties (Use van Everdingen-Hurst Unsteady-State Model). | **20 Marks** | **L3** | **CO2** |

| | Reservoir | Aquifer |
|---|---|---|
| radius, ft | 2000 | $\infty$ |
| h, ft | 20 | 25 |
| k, md | 50 | 100 |
| $\phi$, % | 15 | 20 |
| $\mu_w$, cp | 0.5 | 0.8 |
| $c_w$, psi$^{-1}$ | $1 \times 10^{-6}$ | $0.7 \times 10^{-6}$ |
| $c_f$, psi$^{-1}$ | $2 \times 10^{-6}$ | $0.3 \times 10^{-6}$ |