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PRESIDENCY UNIVERSITY

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Bengaluru

Mid Term Examinations - October 2026

Date: 07/10/2026 **Time:** 02:00 PM - 03:30 PM

Course Code: PET2119 **Course Name:** Oil and Gas Well Test Analysis

Semester: Fifth Semester **Max. Marks:** 50 **Weightage:** 50%

CO - Levels	CO1	CO2	CO3
Marks	24	24	42

PART A: Answer Following Questions. 10 M

Q.N.	Questions	M	CO	BT
1	State the importance of the 'Ideal Reservoir Model'.	2	CO1	BT1
2	List the governing equations used to derive the radial diffusivity equation.	2	CO2	BT1
3	State 'Radius of Investigation' in transient well testing.	2	CO1	BT1
4	Relate effective wellbore radius with skin.	2	CO2	BT1
5	Outline the main uses of the Reservoir Limit Test in well testing.	2	CO3	BT1

PARTB: Answer Any 1 Following Questions. 20 M

Q.N.	Questions	M	CO	BT
06.A	Illustrate the radial diffusivity equation for transient flow in a porous medium, where the total time is considered in days.	10	CO2	BT3
06.B	Generalise the transient state for an infinite-acting reservoir and the pseudosteady-state conditions for a bounded reservoir. Describe how a steady-state condition in a reservoir can be appropriate.	10	CO1	BT2
07.A	An oil well is producing at a constant flow rate of 300 STB/day under unsteady-state flow conditions. The reservoir has the following rock and fluid properties: Formation volume factor=1.25 bbl/STB Oil viscosity=1.5 cp Total compressibility=12×10^{-6} psi^{-1} Permeability = 60 md Formation thickness = 15 ft Porosity =15% Wellbore radius =0.25 ft Initial reservoir pressure, pi=4000 psi Calculate the reservoir pressure at radial distances of r = 50 ft and r = 2000 ft from the wellbore after a production time of 12 hours.	10	CO2	BT3
07.B	1. Estimate the skin factor and the effective wellbore radius resulting from the invasion of the drilling fluid to a radius of 2 feet. The permeability of the skin zone is estimated at 20 md as compared with the unaffected formation permeability of 60 md. The wellbore radius is 0.25 ft. **(6 marks)** 2. State Constant Terminal Pressure Solution. **(2 marks)** 3. Define Horner's Approximation. **(2 marks)**	10	CO1	BT2

PARTC: Answer Any 1 Following Questions. 20 M

Q.N.	Questions	M	CO	BT

PTO (Please Turn Over)

<table>
<tr><td>08.A</td><td>Compare and contrast wellbore damage and wellbore storage, and identify the different types of skin that can develop in the reservoir. Graphically break down the different time regions in Horner’s plot of the actual build-up test.</td><td>10</td><td>CO3</td><td>BT4</td></tr>
<tr><td>08.B</td><td>Examine the assumptions of the ideal build-up test and graphically demonstrate the working principle of a pressure build-up test. Mathematically examine the pressure behaviour in the well during the shut-in period using Horner’s correlations.</td><td>10</td><td>CO3</td><td>BT4</td></tr>
<tr><td>09.A</td><td>A new oil well produced 500 STB/D for 3 days before being shut in for a pressure buildup test, during which the pressure data in the table below were recorded.
<table><tr><td>Time After Shut-In Δt (hr)</td><td>P_{ws} (psig)</td></tr><tr><td>0</td><td>1150</td></tr><tr><td>2</td><td>1794</td></tr><tr><td>4</td><td>1823</td></tr><tr><td>8</td><td>1850</td></tr><tr><td>16</td><td>1876</td></tr><tr><td>24</td><td>1890</td></tr><tr><td>48</td><td>1910</td></tr></table>For this well, the following reservoir and fluid properties are known:
· Net sand thickness, h = 22 ft
· Formation volume factor, B_o = 1.3 RB/STB
· Porosity, φ = 0.20
· Total compressibility, $c_t = 20 \times 10^{-6}$ psi^{-1}
· Oil viscosity, μ_o = 1.0 cp
· Wellbore radius, r_w = 0.3 ft
Calculate from the Horner’s semi-log plot the slope of the line, the reservoir static pressure, and the reservoir pressure at 1 hour after the shut-in of the well.</td><td>10</td><td>CO3</td><td>BT4</td></tr>
<tr><td>09.B</td><td>From the given data and plot generated in Question No 8 (a.), calculate the following:
1. Formation permeability
2. Skin factor
3. Pressure drop due to skin
4. Formation capacity
5. Damage ratio</td><td>10</td><td>CO3</td><td>BT4</td></tr>
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