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**PRESIDENCY UNIVERSITY  
BENGALURU**

**SCHOOL OF ENGINEERING  
MID TERM EXAMINATION - NOV 2023**

**Semester :** Semester V - 2021

**Course Code :** PET2019

**Course Name :** Sem V - PET2019 - Oil and Gas Well Test Analysis

**Program :** B. TECH

**Date :** 2-NOV-2023

**Time :** 2:00PM - 3:30PM

**Max Marks :** 50

**Weightage :** 25%

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**Instructions:**

- (i) Read all questions carefully and answer accordingly.*
  - (ii) Question paper consists of 3 parts.*
  - (iii) Scientific and non-programmable calculator are permitted.*
  - (iv) Do not write any information on the question paper other than Roll Number.*
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**PART A**

**ANSWER ALL THE QUESTIONS**

**(5 X 2 = 10M)**

1. List the type of solutions used to solve the diffusivity equation. Write down the formula to calculate pressure at any radius (r) and at any time (t) [i.e.,  $p(r,t)$ ] from any one of the solution.  
(CO1) [Knowledge]
2. Define pseudo-steady state flow with respect to petroleum reservoir.  
(CO1) [Knowledge]
3. Write down the mathematical expression for Darcy's law describing all terms with field units. Also, state assumptions for Darcy's Law.  
(CO1) [Knowledge]
4. State the steps followed to conduct pressure build-up test.  
(CO2) [Knowledge]
5. Describe wellbore storage.  
(CO2) [Knowledge]

## PART B

### ANSWER ALL THE QUESTIONS

(2 X 10 = 20M)

6. Elaborate on the skin factor concept and provide its formula. Discuss the possibility of skin factor values being positive, negative, or zero and elucidate their significance.

(CO1) [Comprehension]

7. As a Petroleum Engineer, you've been furnished with the following attributes of a well and reservoir. Specifically, the well exclusively yields oil and it is producing at a constant rate of 20 barrels per day. Here is the data delineating the well and reservoir:

$\mu = 0.72$  cp;  $k = 0.1$  md;  $P_i = 3000$  psi;  $r_e = 3000$  ft;  $r_w = 0.5$  ft;  $B = 1.475$  rb/STB

$h = 150$  ft;  $\phi = 23\%$ ;  $S = 0$ ; if  $x < 0.02$ , then  $Ei(-x) = \ln(1.781x)$ ;  $c_t = 1.5 \times 10^{-6}$

Estimate the reservoir pressure at a radius of 1 ft after 3 hours.

(CO1) [Comprehension]

## PART C

### ANSWER THE FOLLOWING QUESTION

(1 X 20 = 20M)

8. A recently drilled oil well yielded a daily output of 400 barrels for a duration of 2.5 days. Subsequently, the well was temporarily closed for a pressure build-up test, during which the data presented in the table below were documented:

**Table : Pressure Build-up Data**

Shut-in Time [i.e., $\Delta t$ (hours)]	Shut-in Pressure [(i.e., $P_{ws}$ (psi)]
0	1,165
2	1,801
4	1,838
8	1,865
16	1,891
24	1,905
48	1,925

The details concerning the other well and reservoir data are outlined below:

$\mu = 2$  cp;  $c_t = 19.5 \times 10^{-6}$  psi<sup>-1</sup>;  $r_w = 0.29$  ft;  $B = 1.25$  rb/STB;  $h = 20$  ft;  $\phi = 0.20$

Determine (a) the slope of Horner's Plot; (b) formation permeability (k); (c) initial reservoir pressure ( $P_i$ ); and (d) skin factor (s)

[5X4=20]

**[Provide Semi-Log Graph for this question]**

(CO2) [Application]