

فصل الربيع 2016/2015 كلية الهندسة- جامعة مصراتة القسم / هندسة نفط
 الامتحان النهائي لمقرر: تحليل الضغوط العابرة (425) الزمن / 3 ساعات
 التاريخ / 2016/05/26 م أستاذ المادة / أ. أحمد مصطفى بادي
 اسم الطالب / رقم الطالب /

(Open Book Exam)

Problem 1

(15 marks)

A two- rate flow test was run on an oil well by stabilizing the flow rate at 85 STB/day then reducing the flow rate to 50 STB/day. Cumulative oil production was 32000 STB. The flowing bottom-hole pressure at time of rate change " P_{wf} " was 3200 psia:

Other pertinent data are :

$$\begin{array}{lll} \mu_o = 0.43 \text{ cp} & h = 11 \text{ ft} & C_i = 5.72 \times 10^{-5} \text{ psi}^{-1} \\ r_w = 0.333 \text{ ft} & \beta_o = 1.450 \text{ bbl/STB} & \phi = 0.14 \\ p_i = 4400 \text{ psi} & \rho_o = 52.7 \text{ lb/ft}^3 & A_a = 0.0218 \text{ ft}^2 \end{array}$$

The pressure data during the second rate are shown in the table below:

Time, $\Delta t'$ <u>hrs</u>	P_{wf} <u>psi</u>
0.50	3245
1.00	3285
1.50	3310
2.00	3330
3.00	3355
4.00	3375
5.00	3390
6.00	3405

Determine :

- 1). The formation permeability .
- 2). The skin factor.
- 3). The pressure drops across the skin at rates q_1 and q_2 respectively.
- 4). The time needed to end the wellbore storage effect.

Problem 2

(15 marks)

A falloff test was done in a water injection well, before the test all the wells in the reservoir had been shut-in for several weeks until the reservoir pressure had stabilized . The reservoir rock and fluid properties are :

$$\begin{array}{llll} \text{Depth} = 4819 \text{ ft} & r_w = 0.354 \text{ ft} & h = 49 \text{ ft} & \phi = 0.16 \\ \mu_w = 1.0 \text{ cp} & \beta_w = 1.027 \text{ bbl/STB} & S_o = 0.2 & q_{inj} = 1426 \text{ STB/d} \\ C_w = 3 \times 10^{-6} \text{ psi}^{-1} & C_o = 3 \times 10^{-6} \text{ psi}^{-1} & C_g = 1.0 \times 10^{-6} \text{ psi}^{-1} & S_g = 0.0 \\ C_f = 4 \times 10^{-6} \text{ psi}^{-1} & \rho_w = 62.5 \text{ lb/ft}^3 & W_{inj} = 2380 \text{ m scf} & P_{i@\Delta t=0} = 525 \text{ psig} \end{array}$$

The pressure recorded data are :

<u>Δt, hrs.</u>	<u>P_{1s} psig</u>	<u>Δt, hrs.</u>	<u>P_{1s} psig</u>
1.0	268	6.0	159
2.0	225	7.0	153
3.0	202	8.0	140
4.0	184	9.0	135
5.0	172		

By using Horner method , find ;

- 1). Undamaged formation permeability.
- 2). Additional pressure drop due to the damage.
- 3). Injectivity indices .
- 4). Flow efficiency.

Problem 3

(20 marks)

An oil well located in the center of several other wells in a consolidated sandstone reservoir was chosen for a pressure build-up test . The well had been put on production for 80 hours at a constant flow rate of 500 STB/day , then the well was shut in the build-up test. The well was drilled in the center of 80 acre squared- drilling pattern.

The rock and fluid properties are as follows :

$$\begin{array}{lll} \beta_o = 1.31 \text{ bbl/STB} & S_o = 0.80 & \mu_o = 0.87 \text{ cp} \\ \Phi = 0.253 & h = 22 \text{ ft} & C_o = 17 \times 10^{-6} \text{ psi}^{-1} \\ r_w = 0.333 \text{ ft} & C_w = 3 \times 10^{-6} \text{ psi}^{-1} & C_f = 4 \times 10^{-6} \text{ psi}^{-1} \end{array}$$

The pressure build-up recorded data are :

Shut-in time <u>Δt, hrs</u>	Shut-in pressure <u>P_{ws}, psi</u>
0.000	3470
0.114	3701
0.201	3705
0.432	3711
0.808	3715
2.051	3722
4.000	3726
8.000	3728
17.780	3730

Is the well under transient or pseudosteady state flow when it was shut in for the build-up test?

Estimate:

- 1). Formation permeability.
- 2). Additional pressure drop around the wellbore due to skin.
- 3). skin factor at $\Delta t = 3$ hrs.
- 4). Shut-in pressure at $\Delta t = 10$ hrs.
- 5). Average reservoir pressure by using Ramey & Cobb method.

Good Luck