

Transient Pressure Analysis
Autumn Semester 2013-2014 / Final Exam
 (Open Book Exam)
 (time : 3 hours)

Date : Thurs. 23/01/2014

Problem 1

(20 marks)

A pressure-build up test was conducted on a well early of the life of an oil reservoir having a rock and fluid reservoir properties :

$$\begin{aligned} \mu_o &= 0.8 \text{ cp} & h &= 15 \text{ ft} & C_t &= 15 \times 10^{-6} \text{ psi}^{-1} \\ r_w &= 0.333 \text{ ft} & \beta_o &= 1.25 \text{ bbl/STB} & \phi &= 25 \% \end{aligned}$$

The flowing bottom - hole pressure before shut in was 1384 psia.

The rate schedule was :

<u>Rate, STB/d</u>	<u>Duration, days</u>
200	1.5
100	2.0
125	6.0

The pressure recorded data :

<u>Shut-in time</u>	<u>shut-in hole pressure</u>
<u>Δt, hrs</u>	<u>P_{ws}, psia</u>
0	1384
2	1530
3	1535
4	1538
5	1540
8	1546
10	1549
12	1551
19	1556
24	1559
36	1563

By using Horner Approximation method determine:

- 1). The production time to be used in the Horner plot.
- 2). The effective permeability to oil .
- 3). Additional pressure drop due to damage .
- 4). Average drainage area pressure by using MBH method.
- 5). Skin factor at the average drainage area pressure.
- 6). Initial reservoir pressure.

Problem 2

A). Three hours drawdown test was conducted ,the production rates and the recorded flowing bottom-hole pressure are listed below : (10 marks)

Time, hrs.	Oil flow rate, STB/d	flowing bottom- hole pressure, psi
1.0	478.5	778.5
2.0	319.0	1378.5
3.0	159.5	2094.0

The rock and fluid properties are :

$$\begin{aligned} \phi &= 12\% & h &= 10 \text{ ft} & \mu_o &= 0.6 \text{ cp} & P_i &= 3000 \text{ psi} \\ \beta_o &= 1.2 \text{ bbl/STB} & r_w &= 0.25 \text{ ft} & C_i &= 4.8 \times 10^{-6} \text{ psi}^{-1} \end{aligned}$$

Estimate the oil permeability and the skin factor.

B). The following characteristics are given for a gas well (5 marks)

$$\begin{aligned} \text{well depth} &= 5500 \text{ ft} & r_w &= 0.39 \text{ ft} & \mu_g &= 0.0175 \text{ cp} \\ C_{ws} &= 0.000595 \text{ psi}^{-1} & h &= 5 \text{ ft} & k &= 25 \text{ md.} \end{aligned}$$

Assume there is no bottom hole packer. Calculate the time required for wellbore storage effects to become negligible.

C). a). Russel method is used to analyze the build-up test at

b). Slider's technique for pressure build up analysis is used when the reservoir is

c). When the build-up test analysis shows two straight lines where the first straight line slope is twice the second straight line slope, this means

d). Ramey & Cobb method for estimating average reservoir pressure used for

Problem 3

(20 marks)

A constant-rate drawdown test was run in an oil well by stabilizing the flow rate at 250 STB/day. The flowing bottom-hole pressure was recorded as shown in the list below. The rock and fluid parameters are:

$$\begin{aligned} \beta_o &= 1.136 \text{ bbl/STB} & r_w &= 0.198 \text{ ft} \\ \mu_o &= 0.80 \text{ cp} & C_i &= 17 \times 10^{-6} \text{ psi}^{-1} \\ h &= 69 \text{ ft} & \Phi &= 0.039 \\ P_i &= 4412 \text{ psi} \end{aligned}$$

The flowing bottom-hole pressure data are :

$\Delta t, \text{ hrs}$	$P_{wf}, \text{ psi}$	$\Delta t, \text{ hrs}$	$P_{wf}, \text{ psi}$
10	3585	130	3505
14.5	3573	185	3490
21	3560	222	3480
30	3550	265	3472
43	3537	320	3460
62	3525	385	3445
90	3515	460	3430

Calculate :

- 1). Formation permeability.
- 2). Pressure drop due to skin around the wellbore.
- 3). Dietz shape factor and the reservoir geometrical configuration
- 4). Reservoir Drainage area .
- 5). Using the pseudosteady state flow straight line equation to confirm that the initial pressure is 4412 psi .

Good Luck

