كلية الهندسة – جامعة مصراته

القسم: الهندسة النفطية
الزمن: ثلاث ساعات
أستاذ المقرر: أ. عبدالله الشوبكي

الامتحان النهائي

فصل الربيع : 2013 / 2014
المقرر: تطبيقات هندسة المكامن.
التاريخ: 2014/06/24 م

الأسئلة: صفحتان
كل سؤال: 15 درجة

أجب عن جميع الأسئلة الآتية
ملاحظة: تسلم الأسئلة مع كراسة الإجابة

Q1) i) Calculating the initial gas reserve of a 160-acre unit of the Bell Gas Field by volumetric depletion and under partial and complete water drive.

Given:

Average porosity = 22%

Connate water = 23%

Residual gas saturation after water displacement = 34%

Bgi = 0.00533 cu ft/Scf at Pi = 3250 psia

Bg = 0.00667 cu ft/Scf at 2500 psia

Bg = 0.03623 cu ft/Scf at 500 psia

Area = 160 acres Net productive thickness = 44 ft

Calculate:

i) **Pore volume.**
ii) **Initial gas in place.**
iii) **Gas in place after volumetric depletion to 2500 Psia.**
iv) **Gas in place after volumetric depletion to 500 Psia.**
Initial reserve by water drive at 3250 Psia. Sg = 34%

ii) Data: **Bulk Volume = 60,000 acre.ft**
Pay Zone Thickness = 60 ft
Total Porosity (ϕ)= 41%
Effective porosity = 22%
Oil Saturation = 72%
βoi=at in. Condition = 0.83 STB/ResBLL
Qo = 150 STB/Day
Time Production data = 5 years

Calculate **1 - Stock tank oil in place.**
2- Recovery Factor.

Q2) i) The following data:

Area = 26700 acres Porosity = 8% Average Swi=45%
Net Pay Zone = 49 ft

Initial reservoir pressure Pi = 2980 Psi Bo @ Pi = 1.68 bll/STB

Abandonment pressure Pa = 300 Psi Bo @ Pa = 1.15 bll/STB

Sg @ Pa = 34% Sor after water invasion = 20%

Calculate:

i) **Initial oil in place.**
ii) **Oil in place after volumetric depletion to abandonment pressure.**
iii) **Oil in place after water invasion at initial pressure.**
iv) **Oil reserve by volumetric depletion to abandonment pressure.**

ii) The pressure history of a water-drive oil reservoir is given below:

T, days	P, psi
0	3600 (pi)
100	3450
200	3410
300	3380
400	3340

The aquifer is under a steady-state flowing condition with an estimated 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.

Q3) Given .

Bti = 1.35469 bbl/STB	**Bt @ 3700Psig = 1.375 bll/STB**
Sw = 20%	**Cw = 3.6 $\times 10^{-6}$ psi^{-1}**
Bw @ 3600 Psig = 1.04 bll/STB	**Cf = 5.0 $\times 10^{-6}$ psi^{-1}**
Pi = 5100 Psig	**Np = 1.3 $\times 10^{6}$ STB**
Wp = 30000 STB	**We = 0**

i) **Calculation of initial Oil in place in a volumetric, undersaturated reservoir.**

ii) **Calculate the formation and water compressibilities.**

Q4) The following data, Using the reservoir historical data, calculated the water influx by applying the material balance equation. The rate of water influx was also calculated numerically at each time period. Using Craft and Hawkins method

Time, Days	Pressure, Psi	We (10^3bbl)	e_w (bbl/day)	Pi – P (Psi)
0	3793	0	0	0
200	3770	25	390	20
360	3706	172	1279	84
549	3643	480	2158	150
733	3547	978	3187	246
915	3485	1616	3844	308
1100	3416	2388	4458	377

Assuming that the boundary pressure would drop to 3380 psi after 1200 days of production, calculate cumulative water influx at that time.

بالتوفيق للجميع **انتهت الأسئلة**

$$B_t = \left[B_o + (R_{si} - R_s) B_g\right]$$

$$N(B_t - B_{ti}) + \frac{N m B_{ti} (B_g - B_{gi})}{B_{gi}} + W_e = N_p B_t + N_p (R_p - R_{si}) + B_w W_p$$

$$N(B_t - B_{ti}) + N B_{ti} \left[\frac{c_w S_{wi} + c_f}{1 - S_{wi}}\right] \Delta\bar{p} + W_e = N_p B_t + B_w W_p$$

$$c_t = \frac{c_o S_o + c_w S_{wi} + c_f}{1 - S_{wi}} \qquad c_o = \frac{v_o - v_{oi}}{v_{oi}(p_i - \bar{p})} = \frac{B_o - B_{oi}}{B_{oi} \Delta\bar{p}} \qquad B_o = B_{oi} + B_{oi} c_o \Delta\bar{p}$$