كلية الهندسة – جامعة مصراتة

القسم / الهندسة النفطية
الزمن / (3) ثلاث ساعات
أستاذ المادة / أ. ونيس هويدي

الامتحان النهائي

فصل الربيع 2013 / 2014
المقرر / خواص موائع المكمن
التاريخ / 2014/06/17 م

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

Q-1) A gas reservoir with a gas specific gravity of 0.8 , If the reservoir pressure is 6000 psia and the gas Deviation factor (Z) is 0.9. **Calculate**

1- Gas molecular weight. (2 marks)

2- Reservoir temperature. (4 marks)

3- Molar volume. (3 marks)

4- Gas density. (4 marks)

5- Gas formation volume factor. (3 marks)

Q-2) A wet gas is produced through a two-stage separator system. The 555 psia-89°F separator produces 170,516 scf/STB, and the 70°F stock tank produces 492 scf/STB. The stock tank liquid has a gravity of 64.7°API. The compositions of the surface production are given bellow.

1- Calculate the composition of the reservoir gas. (13 marks)

2- Calculate the wet gas formation volume factor (B_{wg}), if (Z) factor is 0.85. (7 marks)

Comp.	M_i	Composition, Separator gas, Mole fraction	Composition, Stock tank gas, Mole fraction	Composition, Stock tank liquid, Mole fraction				
C_1	16	0.8943	0.4615	0.0026				
C_2	30	0.0518	0.1218	0.0042				
C_3	44	0.0313	0.1845	0.0234				
i-C_4	58	0.0043	0.0373	0.0134				
n-C_4	58	0.0103	0.1020	0.0499				
i-C_5	72	0.0028	0.0327	0.0424				
n-C_5	72	0.0032	0.0384	0.0629				
C_6	86	0.0018	0.0206	0.1244				
C_{7+}	111*	0.0002	0.0012	0.6768				
		1.0000	1.0000	1.0000				

Q-3) A saturated crude oil exists at its bubble-point pressure of 4000 psia and a reservoir temperature of 180° F.

Given: API gravity = 50° R_s = 650 scf/STB γ_g = 0.7

1- Calculate the oil density at standard conditions by using Katz method. (8 marks)

2- Calculate the oil viscosity at 14.7 psia and 180° F. (5 marks)

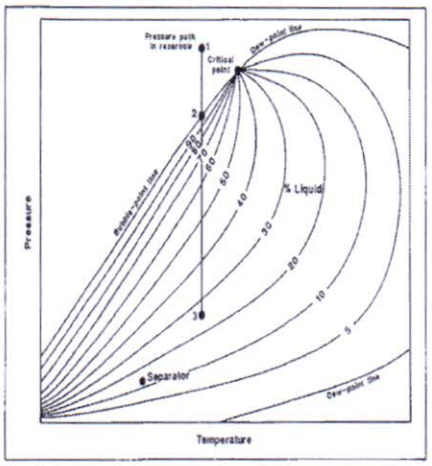
Q-4) **إجابة هذا السؤال في نفس ورقة الأسئلة**

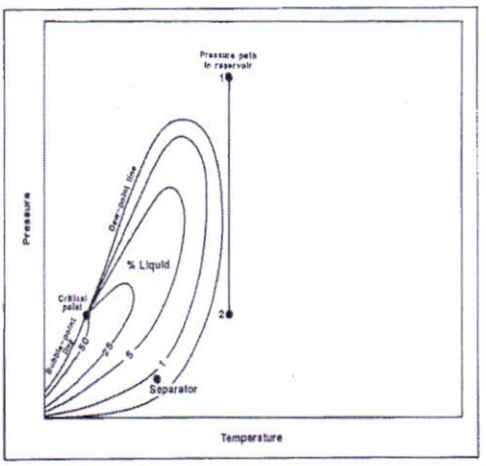
a) Draw the typical relationship between the pressure and the following parameters: (8 marks)

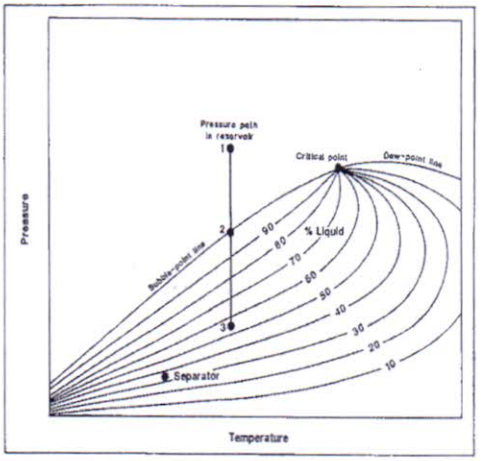
Gas formation volume factor - Oil formation volume factor - Total formation volume factor.

Gas viscosity - Oil viscosity - Gas solubility - Oil Density - Gas compressibility.

b) Write the reservoir fluid type under the sketch. (3 marks)

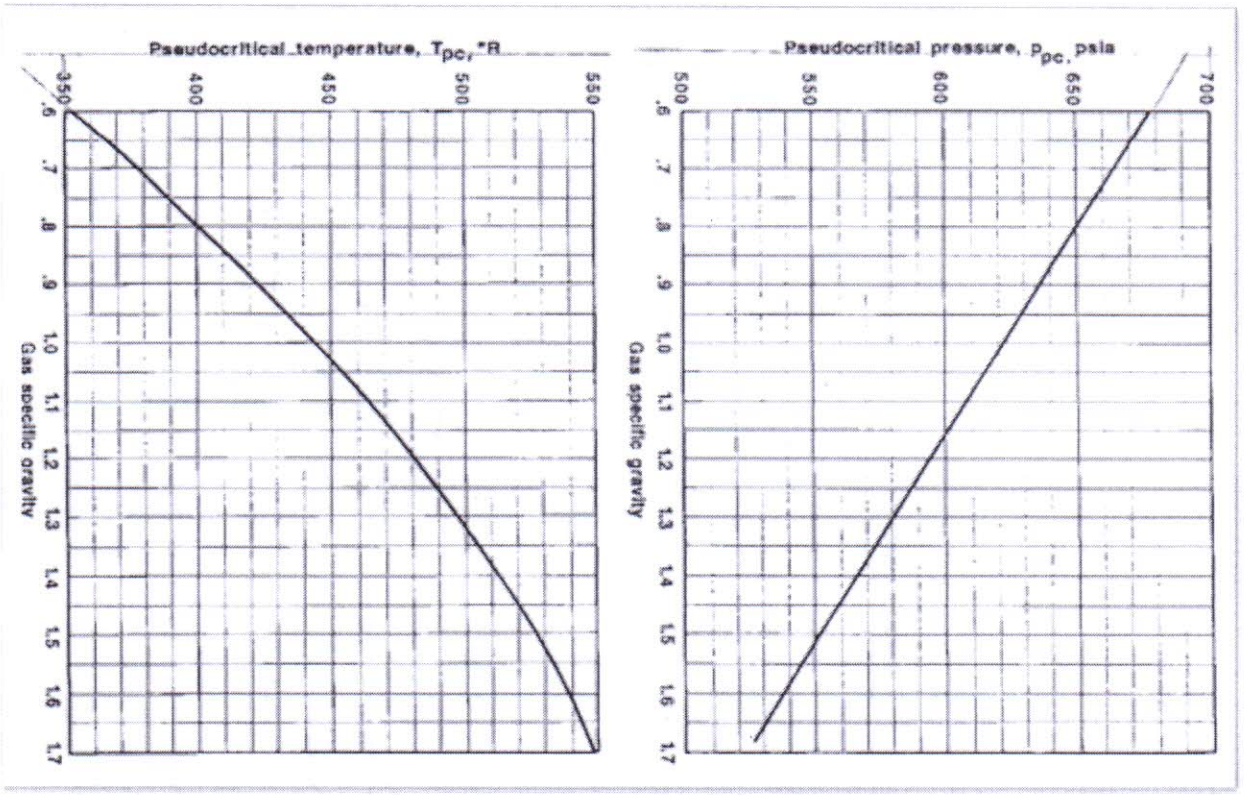


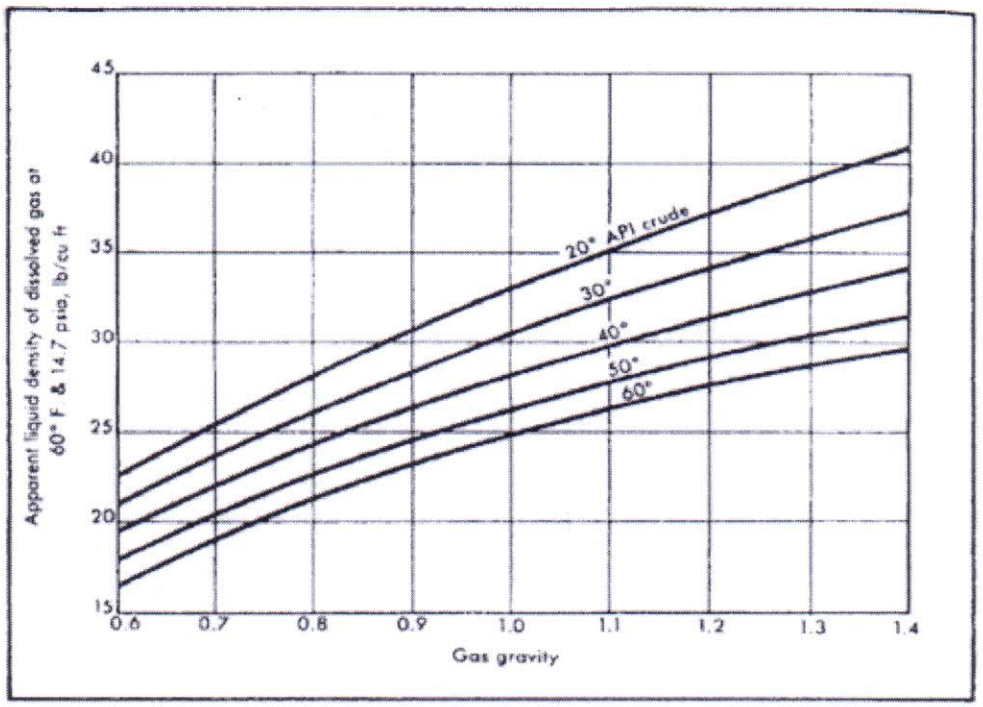




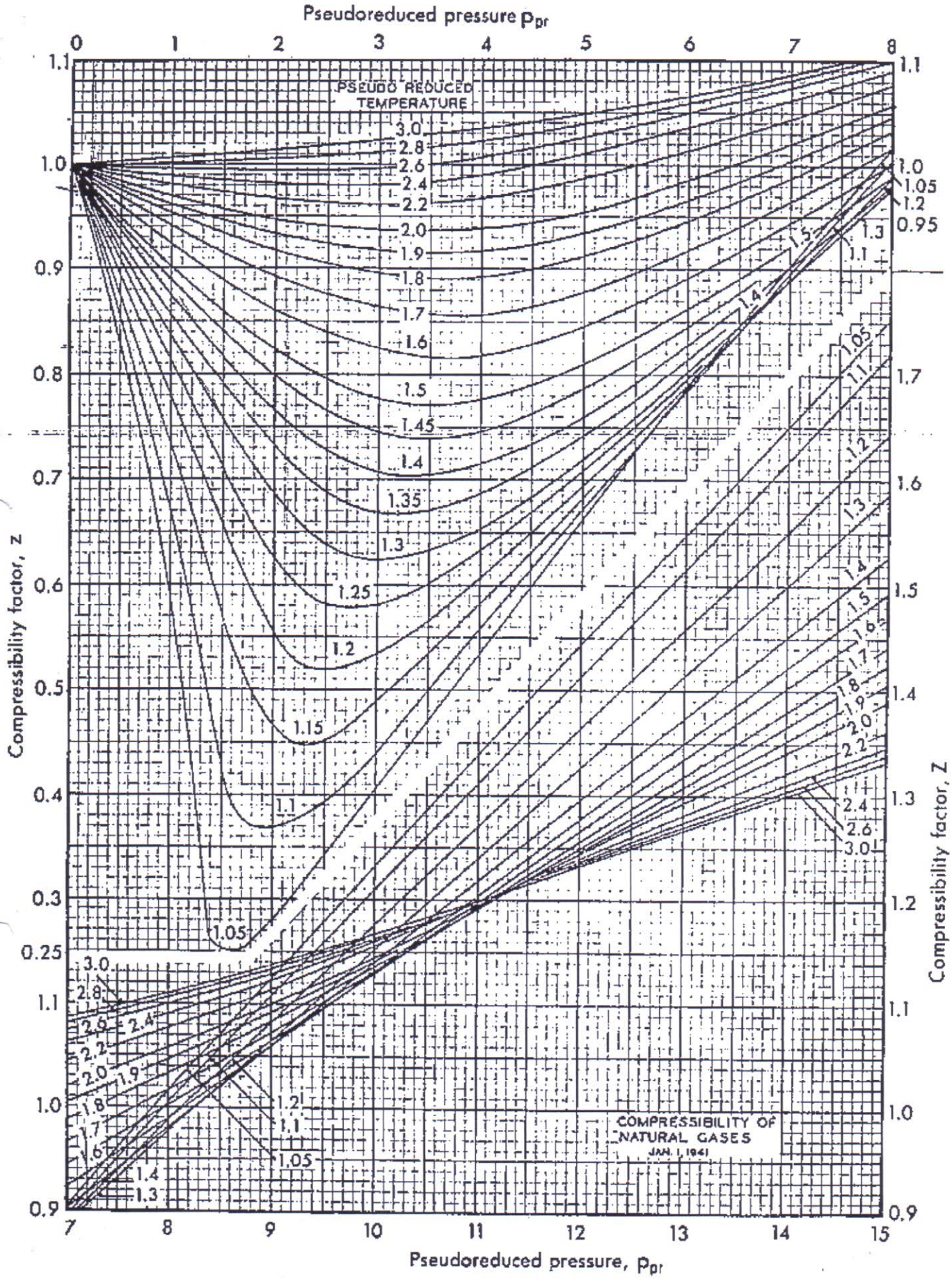
انتهت الأسئلة

$T'_{pc} = T_{pc} - \epsilon$ $p'_{pc} = \frac{p_{pc} T'_{pc}}{T_{pc} + y_{H2S}(1 - y_{H2S})\epsilon}$,	$\mu_o = \mu_{ob} + 0.001(P - P_b)[0.024(\mu_{ob})^{1.6} + 0.038(\mu_{ob})^{0.56}$
$\mu_{od} = \left(0.32 + \frac{1.8(10^7)}{API^{4.53}}\right)\left(\frac{360}{T - 260}\right)^a$ th $a = 10^{(0.43 + 8.33/API)}$	$c_o = 10^{-6} \exp\left[\frac{\rho_{ob} + 0.004347(p - p_b) - 79.1}{0.0007141(p - p_b) - 12.938}\right]$ $\beta_o = 0.9759 + 0.000120\left[R_s\left(\frac{\gamma_g}{\gamma_o}\right)^{0.5} + 1.25(T - 460)\right]^{1.2}$
$p_b = 18.2\,[(R_s/\gamma_g)^{0.83}\,(10)^a - 1.4]$ with $a = 0.00091\,(T - 460) - 0.0125\,(API)$	$\mu_{ob} = (10)^a\,(\mu_{od})^b$ with $a = R_s\,[2.2(10^{-7})\,R_s - 7.4(10^{-4})]$ $b = \frac{0.68}{10^c} + \frac{0.25}{10^d} + \frac{0.062}{10^e}$ $c = 8.62(10^{-5})R_s$ $d = 1.1(10^{-3})R_s$ $e = 3.74(10^{-3})R_s$





Apparent liquid densities of natural gases.


Pseudoreduced pressure p_{pr}
PSEUDO REDUCED TEMPERATURE
Compressibility factor, z
Compressibility factor, Z
Pseudoreduced pressure, p_{pr}
COMPRESSIBILITY OF NATURAL GASES
JAN. 1, 1941