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اسم الطـــالب:

كليـــــة الهـندســـــــــــــة
قســـــــم هنـــــــدسة النفط
الزمن : ثلاث ساعـــ 3 ـــات
أستاد المقرر: أ. وليـد بن صـالح
رقم الطالب:

Notes:

1. It's an Open Book exam; you are allowed to use all relevant materials.
2. Hand in your exam paper along with your answer paper.

Question 1: (15 points).

Using the gas composition given below, and assuming real gas behavior, calculate:

1. Gas density at 2000 psia and 150°F
2. Gas formation volume factor in ft^3/scf at 2000 psia and 150°F
3. Gas viscosity at 2000 psia and 150 °F
4. Specific Volume at 2000 psia and 150 °F

Component	C_1	C_2	C_3	n-C_4	n-C_5
Mole Fraction	0.65	0.15	0.10	0.06	0.04

Question 2: (15 points).

Given the following properties, estimate *the bubble point pressure*, *solution gas oil ratio*, *formation volume factor* and *the viscosity* of a reservoir oil at T=150 °F and at P=5,000 psia Do not use any chart for this problem. Use equations, show all intermediate calculations.

Rs_b = 1,200 SCF/STB
API = 42
γ_g = 0.80
For use above Pb assume $C_o = 13\times10^{-6}$ psi^{-1}

Question 3: (20 points)

The following differential liberation test has been provided to you from the laboratory. You need to determine the following reservoir engineering properties showing all calculations.

- Oil Formation Volume Factors (BoD) (5 points)
- Solution gas oil ratios in SCF/STB (RsD) (15 points)

Differential Depletion Test: Stinky Oil Well– Temperature = 180 °F					
Pressure (psig)	Cm^3 oil	Cm^3 gas	Gas z factor	BoD (bbl/STB)	RsD (SCF/STB)
2777	53.5	0			
2600	52.3	2.4	0.879		
2350	50.8	3.4	0.869		
2100	49.5	3.4	0.868		
1850	48.1	3.8	0.869		
1600	46.9	4.3	0.876		
1350	45.8	4.9	0.887		
1100	44.6	6	0.9		
850	43.4	7.8	0.918		
600	42.1	11.4	0.939		
350	40.8	22.2	0.963		
184	39.4	33.5	0.98		
0	34.6	716.4	1		
0 @ 60 °F	31.5	0			

Useful information:

1 bbl = 158987.3 cm^3

1 ft^3 = 28316.85 cm^3

T_{sc} = 60 °F

P_{sc} = 14.7 psia

1 bbl = 5.615 ft^3

$$\beta_g = 0.0282 \frac{Tz}{P} \frac{ft^3}{scf}$$

Good Luck to you all