Question Paper

Exam Date & Time: 19-May-2022 (10:00 AM - 01:00 PM)

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

VI Semester End Semester Examination

OIL AND GAS RESERVOIR ENGINEERING (CHE 4052)

OIL AND GAS RESERVOIR ENGINEERING [CHE 4052]

Marks: 50 **Duration: 180 mins.**

Descriptive Questions

Answer all the questions. Section Duration: 180 mins

1) Describe the phase behaviour of following reservoir fluids with neat PT profile (4)

A) (a) Black oil (b) Dry gas

B) Explain the terms 'history matching' and 'prediction' related to reservoir engineering with the help of graphs. (3)

C) Derive the expression for gas recovery factor (G_P/G) for volumetric depletion reservoirs (3)

2) For the natural gas composition given in the below table at following reservoir conditions: (5)

A)

Component	Mole fraction	P_{pci} (psia)	T_{pci} (^{0}R)
C_1	0.82	673	344
C_2	0.04	709	550
C_3	0.02	618	666
i-C_4	0.005	530	733
n-C_4	0.003	551	766
i-C_5	0.004	482	830
n-C_5	0.017	485	847
C_6	0.046	434	915
C_7+	0.045	361	1024

Temperature: 240 ^{0}F

Pressure: 4000 psia

Use C_7+ molecular weight: 114.23

Calculate (a) apparent molecular weight

(b) Specific gravity of natural gas

(c) Pseudocritical temperature

(d) Pseudocritical pressure

(e) Pseudoreduced temperature

	B)	Explain any two reservoir drive mechanisms along with neat sketch	(3)
	C)	A brine is used to measure the absolute permeability of a core plug. The rock sample is 6 cm long and 3 cm^2 in cross section. The brine has a viscosity of 3.0 cp and is flowing a constant rate of 0.5 cm^3/sec under a 5.0 atm pressure differential. Calculate the absolute permeability.	(2)

$$q = \frac{kA(p_1 - p_2)}{\mu L}$$

$$q = \frac{0.001127\ kA(p_1 - p_2)}{\mu L}$$

3)		List various available methods to evaluate 'z' factor and describe any one method	(2)
	A)		
	B)	Derive the Schilthuis material balance equation for a hydrocarbon reservoir	(5)
	C)	Explain direct subsurface sampling method to collect fluid samples from a reservoir using neat sketch	(3)
4)		Define following (a) Cumulative gas-oil ratio 'R_p'	(3)
	A)	(b) Instantaneous Gas-Oil Ratio (c) Productivity Index	
	B)	An incompressible fluid flows in a linear porous media with following properties: L= 1000 ft K= 100 md P_1=2000 psi P_2 = 1900 psi Ø = 15% h = 20 ft Width = 300 ft μ = 5 cp Calculate the flow rate using Darcy's law in field units.	(3)

$$q = \frac{kA(p_1 - p_2)}{\mu L}$$

$$q = \frac{0.001127\ kA(p_1 - p_2)}{\mu L}$$

C) Derive the expression for productivity index of a reservoir in field units for radial steady state inflow conditions. List all the assumptions made clearly (4)

5) Explain concept of fluid pressure regime to calculate the GOC and OWC. (2)

A)

B) Explain pressure build-up testing along with rate & wellbore pressure response profile (4)

C) Explain pressure drawdown testing along with rate & wellbore pressure response profile (4)

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