Reg. No.										

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

VII SEMESTER B.TECH (CHEMICAL ENGINEERING)
END SEMESTER (MAKE-UP) EXAMINATION, DEC 2015/JAN 2016
SUBJECT: OIL & GAS RESERVOIR ENGINEERING [CHE 411]
REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 100

Instructions to Candidates:

- Answer **ANY FIVE FULL** the questions.
- Missing data may be suitable assumed.

1A.	Describe how you can estimate the hydrocarbon volumes from geological data.	**5**
1B.	Describe the ways to determine the Z as a function of pressure.	**15**
2A.	Derive the expression for gas recovery factor (G_P/G) for volumetric depletion reservoirs which includes the effects of connate water expansion and pore volume reduction.	**10**
2B.	Describe the phase behavior of different reservoir fluids with neat schematics.	**10**
3A.	The oil and gas rates, measured at a particular time during the producing life of a reservoir are, x stb oil/day and y scf gas/day. a) What is the corresponding underground withdrawal rate in reservoir barrels/day? b) If the average reservoir pressure at the time the above measurements are made is 2000 psia, calculate the daily underground withdrawal corresponding to an oil production of 2200 stb/day and a gas rate of 1.875 MMscf/day. Field PVT parameters are given below. c) If the density of the oil at standard conditions is 58.2 lb/cu.ft and the gas gravity is 0.76 (air = 1), calculate the oil pressure gradient in the reservoir at 2800 psia.	**10**

Pressure, psia	4000	3500	3330	3000	2700	2400	2100	1800	1500	1200	900	600	300
B_o, rb/stb	1.2417	1.248	1.2511	1.2222	1.2022	1.1822	1.1633	1.145	1.1287	1.1115	1.094	1.0763	1.0583
R_s, scf/stb	510	510	510	450	401	352	304	257	214	167	122	78	35
B_g, rb/scf			.00087	.00096	.00107	.00119	.00137	.00161	.00196	.00249	.00339	.00519	.01066

3B.	The Big Butte field is a combination-drive reservoir. The current reservoir pressure is 2500 psia. Volume of bulk oil zone is 100,000 ac-ft and that of gas zone is 20,000 ac-ft. The reservoir production data and PVT information are given below: Calculate the initial oil in place.	**6**

	Pressure, psia	B_o, rb/stb	R_s, scf/stb	N_P, MMstb	G_P, MMMscf	B_g, rb/scf	B_w, rb/stb	W_e, MMrb	W_p, MMrb	C_f, C_w
Initial Conditions	3000	1.35	600	0	0	.0011	1	1.145	1.1287	0
Current Conditions	2500	1.33	500	5	5.5	.0015	1	257	214	0

3C.	What is the gas pressure gradient in a reservoir at 2600 psia and 240^0 F ($Z = 0.921$, $\gamma_g = .875$).	**4**
4.	Derive the Schilthuis material balance equation for a hydrocarbon reservoir which includes the effects of all reservoir drive mechanisms.	**20**
5A.	Explain the production history of a) solution gas, b) gascap and c) natural water drive reservoirs with the help of schematics.	**12**
5B.	What are the differences between flash and differential expansion experiments? Which type of experiment will provide the most realistic values of PVT parameters?	**8**
6A.	Derive the equation of Productivity Index (PI) for a reservoir under radial steady state flow conditions.	**14**
6B.	Explain how does reduction in oil viscosity enhances the oil recovery. How do you achieve the same?	**6**

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