Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
A Constituent Institution of Manipal University

VII SEMESTER B.TECH. (CHEMICAL ENGINEERING)

END SEMESTER MAKEUP EXAMINATIONS, DEC/JAN 2016/17

SUBJECT: OIL AND GAS RESERVOIR ENGINEERING [CHE 411]

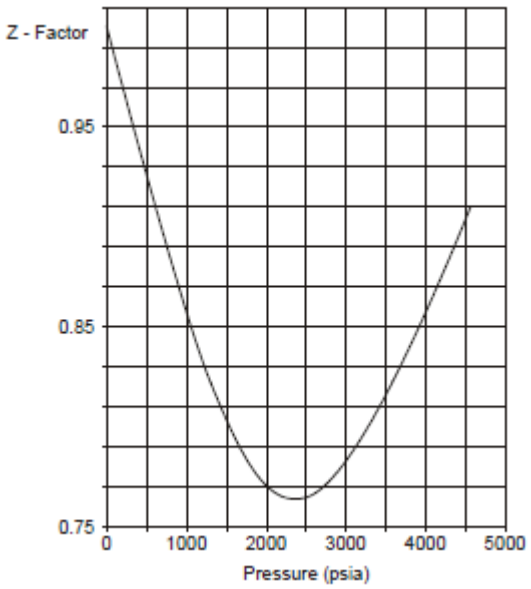
REVISED CREDIT SYSTEM
(02/01/2017)

Time: 3 Hours MAX. MARKS: 100

Instructions to Candidates:

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

1A.	How to you calculate the stock tank oil initially in place (STOIIP).	**5**
1B.	Describe the ways to determine the Z as a function of pressure.	**15**
2.	The following data are available for a newly discovered gas reservoir: GWC = 9700 ft; Centroid depth = 9537 ft; Net bulk volume (V) = 1.776 X 10^{10} cu.ft; Φ = 0.19; S_{wc} = 0.20; γ_g = 0.85. It is estimated that the water pressure regime in the locality, P_w = 0.441D+31 psia and the temperature gradient is 1.258°F/100 ft, with ambient surface temperature 80°F. 1) Calculate the volume of the GIIP. 2) It is intended to enter a gas sales contract in which the following points have been stipulated by the purchaser. a) During the first two years, a production rate build-up from zero-100 MMscf/d must be achieved while developing the field. b) The plateau rate must be continued for 15 years at a sales point delivery pressure which corresponds to a minimum reservoir pressure of 1200 psia. Can this latter requirement be fulfilled? (Assume that the aquifer is small). c) Once the market requirement can no longer be satisfied the field rate will decline exponentially by 20% per annum until it is reduced to 20 MMscf/d. What will be the total recovery factor for the reservoir and what is the length of the entire project life?	**20**
3A.	Explain the surface recombination sampling.	**5**



3B. 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. **15**

i) What is the corresponding underground withdrawal rate in reservoir barrels/day?

ii) If the average reservoir pressure at the time the above measurements are made is 2400 psia, calculate the daily underground withdrawal corresponding to an oil production of 2500 stb/day and a gas rate of 2.125 MMscf/day. Field PVT parameters are given below.

Pressure, psia	B_o, rb/stb	R_s, scf/stb	B_g, rb/scf
2400	1.1822	352	.00119

i) If the density of the oil at standard conditions is 52.8 lb/cu.ft and the gas gravity is 0.67 (air = 1), calculate the oil pressure gradient in the reservoir at 2400 psia.

4A. Determine an expression for the recovery at abandonment pressure of 1500 psia as a function of the cumulative gas oil ratio R_p for an unsaturated oil reservoir whose PVT parameters are given below in a table and for which $c_w = 3 \times 10^{-6}$ /psi; $c_f = 8.5 \times 10^{-6}$ /psi; $S_{wc} = 0.20$. What do you conclude from the nature of this relationship? Plot the recovery 0-50% with respect to R_p. **10**

Pressure, psia	4000, p_i	3500	3330, p_b	3000	2700	2400	2100	1800	1500
B_o, rb/stb	1.2417	1.248	1.2511	1.2222	1.2022	1.1822	1.1633	1.145	1.1287
R_s, scf/stb	510	510	510	450	401	352	304	257	214
B_g, rb/scf			.00087	.00096	.00107	.00119	.00137	.00161	.00196

4B. How do you determine the PVT parameters in laboratory and convert these to field parameters. **10**

5. Derive the Schilthuis material balance equation for a hydrocarbon reservoir which includes the effects of all reservoir drive mechanisms. **20**

6A. What is the conversion factor between absolute permeability k, expressed in Darcy and in cm^2 respectively? **5**

6B. Explain how does reduction in oil viscosity enhances the oil recovery. How do you achieve the same? **5**

6C. Describe the mechanics of the supplementary recovery. **10**

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