Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
A Constituent Institution of Manipal University

VI SEMESTER B.TECH. (CHEMICAL ENGINEERING)

END SEMESTER MAKE-UP EXAMINATIONS, JUN 2017

SUBJECT: OIL AND GAS RESERVOIR ENGINEERING [CHE 4002]

REVISED CREDIT SYSTEM
(20/06/2017)

Time: 3 Hours MAX. MARKS: 100

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.

1A.	What are the primary functions of a reservoir engineering? Which concept(s) you need to aware of to evaluate the primary functions? Explain in detail.	**10**
1B.	For a reservoir the exploration well has only penetrated the gascap. The deepest point at which gas has been observed in the well is 5150 ft. A well test is conducted at a depth of 5100 ft, determined that the gas pressure is 2377 psia and, the gas gradient in the reservoir is 0.08 psi/ft. Calculate the fluid contacts, if there is an uncertainty associated with the determination of fluid contacts from pressure measurements.	**5**
1C.	Calculate the density of the gas at standard conditions whose composition is listed below: Component: Methane, Ethane, Propane, Butane, Pentane, Hexane, CO_2, Nitrogen mole fraction: 0.847, 0.0586, 0.022, 0.0093, 0.0052, 0.0104, 0.013, 0.0345 For the above gas what is the pressure gradient in the reservoir at 2000 psia and 180^0 F (Z = 0.865)	**5**
2A.	Write the complete PVT analysis of oil.	**8**
2B.	Define R_s, B_o, B_g parameters.	**6**
2C.	What are investigates that usually carried out for each reservoir drive mechanisms?	**6**
3A.	Determine the fractional oil recovery of a solution gas drive reservoir, during depletion down to bubble point pressure, whose PVT parameters are listed in below table and for which $C_w = 3*10^{-6}$ /psi; $C_f = 8.6*10^{-6}$ /psi; $S_{wc} = 0.20$. Write remarks on the result.	**8**

		Pressure, psia	4000, p_i	3330, p_b	900
		B_o, rb/stb	1.2417	1.2511	1.0940
		R_s, scf/stb	510	510	122
		B_g, rb/scf	-	0.00087	0.00339
3B.	The reservoir described in Q. No: 3A will be produced down to an abandonment pressure of 900 psia. State the assumptions clearly for this situation and determine an expression for the recovery at abandonment as a function of the cumulative gas oil ratio Rp. What do you conclude from the nature of this relationship? Plot the recovery 0-50% with respect to Rp.				**12**
4A.	Derive the following basic equation for the radial flow of a fluid in a homogeneous porous medium with a neat schematic. $\frac{1}{r}\frac{\partial}{\partial r}(\frac{k\rho}{\mu}r\frac{\partial p}{\partial r}) = \phi c\rho\frac{\partial p}{\partial t}$. Clearly mention the assumptions considered.				**10**
4B.	Discuss the semi steady state and steady state conditions of solution for the above radial flow differential equation.				**5**
4C.	Linearize the above basic radial flow equation for fluids of small and constant compressibility by mentioning the assumptions considered.				**5**
5A.	A homogeneous formation in a reservoir has an average effective permeability k_e. The effective permeability out to a radius r_a from the well has been damaged so that its average value in this region is k_a. Show that the skin factor may be expressed as $S = \frac{k_e - k_a}{k_a}\ln\frac{r_a}{r_w}$ where r_w is the wellbore radius. Assume that for $r < r_a$ the flow can be described under steady state conditions and that for $r > r_a$ semi steady state.				**10**
5B.	During drilling, a well is damaged out to a radius of 4 ft from the well bore, r_a so that the permeability within the damaged zone, k_a is reduced to 1/100th of the undamaged effective permeability, k_e. After completion the well is stimulated so that the permeability out to a distance of 10 ft from the wellbore is increased to ten times the undamaged permeability. What will be the PI ratio increase if the wellbore radius, r_w is 0.333 ft and the drainage radius, r_e is 660 ft?				**10**

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