Reg. No.



MANIPAL INSTITUTE OF TECHNOLOGY

VII SEMESTER B.TECH. (CHEMICAL ENGINEERING) MAKE-UP EXAMINATIONS, DEC 2017 SUBJECT: NATURAL GAS ENGINEERING [CHE 4001] REVISED CREDIT SYSTEM (30/12/2017)

Time: 3 Hours

MAX. MARKS: 50

1A. Discuss the types of natural gas accumulations based on geological traps and define them. 3 1B. For a natural gas with a specific gravity and z-factor of 0.85, 1.3354 respectively, estimate gas density at 6000 psia, and 200 °F. 3 1C. A 0.65 specific gravity natural gas contains 10% nitrogen, 8% carbon dioxide, and 2% hydrogen sulfide. Estimate the z-factor at 5000 psia, and 180 °F. 4 2A. What is gas reservoir deliverability? Explain in detail analytical and empirical methods to evaluate the IPR. 4 2B. Explain the three well deliverability testing methods in detail with the help of schematics. 6 3A. Define wellbore performance analysis. 2 3B. A 0.65 specific gravity gas flows from a 2-in pipe through a 1.5-in nozzle-type choke. The upstream pressure and temperature are 100 psia and 70 °F, respectively. The downstream pressure is 80 psia (measured 2 ft from the orifice). The gas-specific heat ratio is 1.25. Consider nozzle choke coefficient as 1.2. (i) What is the expected daily flow rate? (ii) Is icing a potential problem? (iii) What is the expected pressure at the nozzle outlet? 8 4A. How to perform the Nodal analysis at the wellhead node. Write the procedure in detail. 4 4B. Calculate the liquid capacity of a 20" X 5' size horizontal oil/gas separator for natural gas? 4 4C. What are the basic functions has to be considered while designing a separator for natural gas? 4 <th colspan="4">Instructions to Candidates: Image: Answer ALL the questions. Image: Pormulae sheet provided. Image: Pormulae sheet provided.</th>	Instructions to Candidates: Image: Answer ALL the questions. Image: Pormulae sheet provided. Image: Pormulae sheet provided.			
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	Formulae Sheet			
Pseudocritical Properties				
$P_{pc} = 709.604 - 58.718 \gamma_g$	$P_{pc} = 678 - 50(\gamma_g - 0.5) - 206.7y_{N_2} + 440y_{CO_2} + 606.7y_{H_2S}$			
$T_{pc} = 170.491 + 307.344 \gamma_g$	$T_{pc} = 326 + 315.7(\gamma_g - 0.5) - 240y_{N_2} - 83.3y_{CO_2} + 133.3y_{H_2S}$			

******** END *******