Roll No											

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING
END TERM EXAMINATION - JUN 2023

Semester : Semester VI - 2020
Course Code : PET2019
Course Name : Sem VI - PET2019 - Oil and Gas Well Test Analysis
Program : PET

Date : 7-JUN-2023
Time : 9.30AM - 12.30PM
Max Marks : 100
Weightage : 50%

Instructions:
(i) Read all questions carefully and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and non-programmable calculator are permitted.
(iv) Do not write any information on the question paper other than Roll Number.

PART A

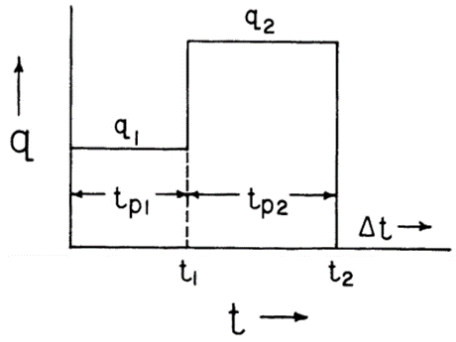
ANSWER ALL THE QUESTIONS **(10 X 3 = 30M)**

1. List the parameters that is determined by conducting the pressure build up test.
(CO2) [Knowledge]
2. Describe wellbore storage effect with respect to pressure build-up test and pressure drawn test.
(CO2) [Knowledge]
3. State back-pressure equation and describe its significance in gas well testing.
(CO4) [Knowledge]
4. Explain steps that are followed in modified isochronal test.
(CO4) [Knowledge]
5. Explain the significance of Horner's approximation.
(CO1) [Knowledge]
6. Describe the effective wellbore radius.
(CO3) [Knowledge]
7. Define steady, unsteady, and pseudo-steady states in context of petroleum reservoirs.
(CO1) [Knowledge]
8. Define the principle of superposition and describe its significance.
(CO1) [Knowledge]
9. State skin factor and its significance.
(CO2) [Knowledge]
10. Describe pressure drawdown test.
(CO3) [Knowledge]

PART B

ANSWER ALL THE QUESTIONS **(2 X 15 = 30M)**

11. It is well-known that a constant flow rate is a prerequisite for an accurate pressure build-up test. However, being a petroleum engineer, you know that two different flow rates exist, as shown in the figure below. Estimate the modification in the formula of the ideal pressure build-up test that you will suggest for two rates of pressure build-up test.



(CO3) [Comprehension]

12. A gas well with a wellbore radius of 0.3 ft produces a constant flow rate of 2000 Mscf/day under transient flow conditions. The initial reservoir pressure (shut-in pressure) is 4400 psi at 140°F. The formation permeability and thickness are 65 md and 15 ft, respectively. The porosity is recorded as 15%. Assuming the initial total isothermal compressibility is 3 × 10^{-4} psi−1, estimate the bottom-hole flowing pressure after 5 hours. The following table represents the gas's properties and values of m(p) as a function of pressures.

p	μ_g (cp)	z	m(p), psi²/cp
0	0.01270	1.000	0.000
400	0.01286	0.937	13.2×10^6
800	0.01390	0.882	52.0×10^6
1200	0.01530	0.832	113.1×10^6
1600	0.01680	0.794	198.0×10^6
2000	0.01840	0.770	304.0×10^6
2400	0.02010	0.763	422.0×10^6
2800	0.02170	0.775	542.4×10^6
3200	0.02340	0.797	678.0×10^6
3600	0.02500	0.827	816.0×10^6
4000	0.02660	0.860	950.0×10^6
4400	0.02831	0.896	1089.0×10^6

(CO4) [Comprehension]

PART C

ANSWER ALL THE QUESTIONS **(2 X 20 = 40M)**

13. The following data are recorded for pressure drawdown in the table given below, along with the reservoir data.

Time (hr)	Pwf (psi)	Time (hr)	Pwf (psi)	Time (hr)	Pwf (hr)
2	950	8	934	16	927
3	947	10	932	20	923
4	942	11	931	30	915
5	939	12	930	40	907
6	937	13	929		
7	936	15	928		

Reservoir data: h = 130 ft; rw = 0.25; q = 348 STB/day; B = 1.14 bbl/day; μ = 3.93 cp; Ct = 8.74 X 10^{-6} ; φ = 20%; Pi = 1154;

Assume that wellbore storage effects are not significant, calculate:

a. Permeability

b. Skin Factor

c. Pressure drops due to skin.

(CO3) [Application]

14. Answer the followings:

a. As a reservoir engineer, you are asked to perform gas well test analysis of formation with HIGH permeability. Decide the test you will perform and illustrate the steps to evaluate various reservoir characteristics.

b. As a petroleum engineer, you are asked to perform gas well test analysis of formation with LOW permeability. Decide the test you will perform and illustrate the steps to evaluate various reservoir characteristics.

(CO4) [Application]