Roll No											

PRESIDENCY UNIVERSITY
BENGALURU

SET B

SCHOOL OF ENGINEERING
END TERM EXAMINATION - JAN 2024

Semester : Semester V - 2021
Course Code : PET2019
Course Name : Oil and Gas Well Test Analysis
Program : B.Tech.

Date : 09-JAN-2024
Time : 9:30AM - 12:30 PM
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 **5 X 2M = 10M**

1. Describe effective wellbore radius.

(CO1) [Knowledge]

2. Describe the effective wellbore radius.

(CO3) [Knowledge]

3. Describe two-rate test.

(CO3) [Knowledge]

4. State the mathematical expression for deliverability equation.

(CO4) [Knowledge]

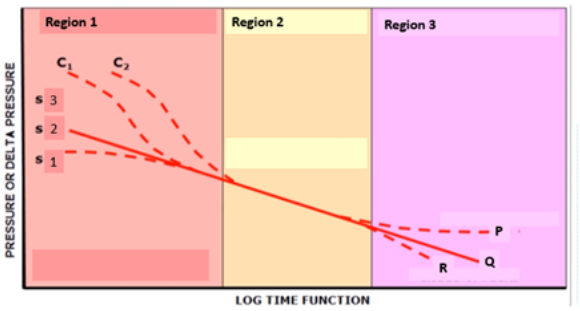
5. Describe the significance of exponent "n" in back pressure equation.

(CO4) [Knowledge]

PART B

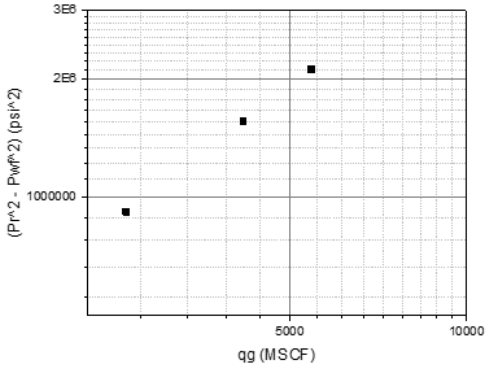
ANSWER ALL THE QUESTIONS **5 X 10M = 50M**

6. Pressure drawdown tests provide crucial insights into reservoir behaviour, helping operators optimize production strategies, enhance recovery efficiency, and plan for future reservoir management. As a reservoir engineer, provide insights and comments on the pressure drawdown plot for different reservoirs, discussing the distinctive characteristics and regions depicted in the graph (Region 1, 2, 3, C1, C2, S1, S2, S3, P, Q and R).



(CO3) [Comprehension]

7. A conventional 3-point deliverability test, specifically a flow-after-flow test, was conducted on a gas well, and the corresponding graph is depicted in the figure. The slope of the linear segment in the graph is calculated as 1.1495, the performance coefficient is provided as 0.017006, and the average reservoir pressure is noted as 1952 psi. Estimate the absolute open flow (AOF).

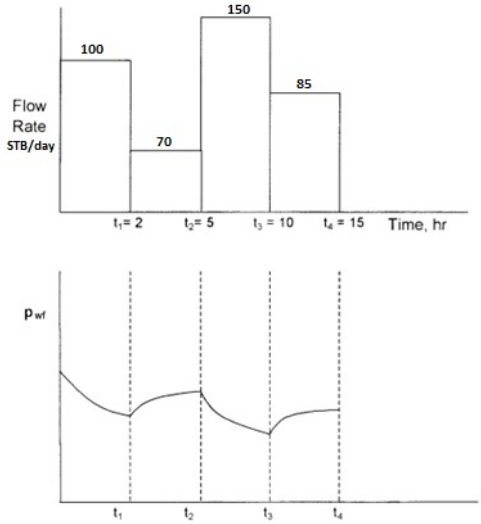


(CO4) [Comprehension]

8. In your role as a petroleum engineer, you have been tasked with performing a gas well test analysis for a formation with **LOW** permeability. Identify the appropriate test to conduct and provide a detailed explanation of the steps involved in evaluating the back pressure equation.

(CO4) [Comprehension]

9. Figure shows the rate history of a well that is producing under transient flow condition for 15 hours. Given the following data: pi = 5000 psi; h = 20'; B = 1 bbl/STB; φ= 15%; μ= 2.5 cp; r_w = 0.3 ft; ct = 20 X 10^{-6} psi-1; s = 0; k = 40 md. Estimate the sand face pressure after 15 hours.



(CO1) [Comprehension]

10. Horner's plot, named after Ralph Horner, is a graphical technique employed in petroleum engineering for the examination of pressure transient data originating from oil and gas wells. Discuss in details Horner's Plot.

(CO2) [Comprehension]

PART C

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

11. The table below presents recorded data for pressure drawdown, along with corresponding reservoir information:

Pressure Drawdown Test data	
Time (hour)	**Pwf (psi)**
2	965
3	962
4	957
5	954
6	952
7	951
8	949
10	947
11	946
12	945
13	944
15	943
16	942
20	938
30	930
40	922

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 = 1169.
Neglecting any notable effects from wellbore storage, compute:
Assume that wellbore storage effects are not significant, calculate (11+3+3+3):

1. Slope of the pressure drawdown test in MTR
2. Permeability
3. Skin Factor
4. Pressure drops due to skin

(Provide semi-log graph for this question)

(CO3) [Application]

12. The table below presents data acquired from a two-rate flow test, along with provided reservoir and well characteristics. Calculate (a) the slope of the two-rate test in the middle time region (MTR), (b) permeability (k), (c) skin factor (s), and (d) pressure drop attributable to skin. (11+3+3+3)

Two-Rate Test Data	
Δt' (Hours)	**Pwf (psi)**
0	3490
0.151	3564
0.313	3627
0.648	3717
1.344	3810
2.788	3868
5.78	3891
12	3903
24.9	3912
51.5	3918
89.1	3918
128	3916
184.7	3910

Reservoir and Well Data	
q1	250 STB/day
q2	125 STB/day
μ	0.8 cp
B	1.136 RB/STB
Ct	17 X10^{-6}
Awb	0.0218 sq ft
rw	0.198 ft
h	69 ft
ρ	53 lb/cu ft
φ	0.039
tp1	184.7 hours

(Provide Normal Graph for this question)

(CO3) [Application]