Exam Date & Time: 07-Jul-2023 (02:30 PM - 05:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

VI Semester End Semester Make-up Examination - July 2023

OIL AND GAS RESERVOIR ENGINEERING [CHE 4052]

Marks: 50   **Duration: 180 mins.**

Descriptive Questions

Answer all the questions.   Section Duration: 180 mins

1)   Calculate the z-factor evaluated using the compressibility chart for the following gas composition at 150^0F and 550 psig:

A)   Compound

Compound	y_i
C1	0.780
C_2	0.160
C_3	0.030
i-C_4	0.010
n-C_4	0.020

(4)

$$P_{PC} = 709.604 - 58.718 * Y_g$$
$$T_{PC} = 170.491 + 307.344 * Y_g$$

B)   Explain anticlinal or dome type reservoir along with neat sketch.

(3)

C)   Outline and explain three categories of oil recovery mechanisms.

(3)

2)   Outline the differences between wet gas reservoir and dry gas reservoir using neat sketch of PT phase diagram.

(4)

A)

B)   Explain direct subsurface sampling to collect the fluid samples along with neat sketch.

(3)

C)   Explain Klinkenberg effect and Darcy's law.

(3)

3) An oil well is producing at a constant flow rate of 500 STB/day under unsteady-state flow conditions. The reservoir has the following rock and fluid properties:

A) B_o = 1.25 bbl/STB

μ = 2.5 cp

$c = 12 \times 10^{-6}$ psi^{-1}

k = 0.08 Darcy

h = 45 ft

p_i = 4000 psi   (4)

ϕ = 25%

r_w = 0.25 ft

S = 0

Estimate the bottom-hole flowing pressure after 24 hours of production.

$$p_{wf} = p_i - \frac{162.6 q \mu B_o}{kh}\left(\log t + \log \frac{k}{\phi \mu c r_w^2} - 3.23 + 0.87S\right)$$

B) List various available methods to evaluate 'z' factor and describe any one method.   (3)

C) Derive the expression for gas recovery factor (G_P/G) for volumetric depletion reservoirs.   (3)

4) Explain relevant flow regimes using the pressure versus time profiles.   (3)

A)
B) Define following (a) Initial Oil in Place

(b) Instantaneous Gas-Oil Ratio

(c) Productivity Index   (4)

(d)Porosity.

C) A productivity test was conducted on a well. The test results indicate that the well is capable of producing at a stabilized flow rate of 3500 STB/day and a bottom-hole flowing pressure of 200 psi. After shutting the well for 24 hours, the bottom-hole pressure reached a static value of 2800 psi.   (3)

Calculate productivity index (PI).

5) Explain any two well stimulation techniques.   (3)

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A)

B)   Explain carbon dioxide injection EOR along with schematic and list advantages of
        carbon dioxide injection.   (4)

C)   Explain how pressure build-up test is conducted along with idealized drawdown
        profiles.   (3)

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