Name:

Enrolment No:

UPES
End Semester Examination, May 2024

Course: Reservoir Engineering-II **Semester: VI**
Program: B. Tech. APE UP **Time : 03 hrs.**
Course Code: PEAU 3038 **Max. Marks: 100**
Nos. of page(s) : 3

Instructions:
a. **All questions are compulsory.** There is internal choice in **Q9 and Q11.**
b. Answers must carry supporting material such as equations and diagrams.
c. Abbreviations used in the questions are standard and have their usual meaning.

SECTION A
(5Qx4M=20Marks)

S. No.	Statement of question	**Marks**	**CO**
Q 1	Define principle of MBE. Write down the equation to calculate water influx (W_e).	**4**	**CO1**
Q 2	Illustrate the different methods regarding the effect of non hydrocarbon components on the pseudo-critical properties of the gases.	**4**	**CO1**
Q 3	List out the types of compressibility with suitable equations.	**4**	**CO2**
Q 4	Write down the short notes on productivity index and capillary pressure with suitable figure.	**4**	**CO2**
Q 5	Illustrate the types of gas oil ratios with suitable equations. List out the elements of performance prediction.	**4**	**CO3**

SECTION B
(4Qx10M= 40 Marks)

Q 6	(a) Explain coning and mobility ratio. Mention the significance of mobility ratio in coning. Illustrate the reasons and remedies of excessive water in field. (b) Explain types of gas reservoir with suitable P-T diagram.	**10 (5+5)**	**CO2**

<table>
<tr><td>Q 7</td><td>(a)Discuss pressure maintenance. List out the advantages of pressure maintenance. Write down the factors important in WI pressure maintenance.

(b) The pressure history of a water-drive oil reservoir is given below:
<table><tr><th>t, days</th><th>p, psi</th></tr><tr><td>0</td><td>3700 (pi)</td></tr><tr><td>100</td><td>3650</td></tr><tr><td>200</td><td>3610</td></tr><tr><td>300</td><td>3580</td></tr><tr><td>400</td><td>3540</td></tr></table>The aquifer is under a steady-state flowing condition with an estimated water influx constant of 145 bbl/day/psi.

Calculate the cumulative water influx after 100, 200, 300, and 400 days using the steady-state model.</td><td>10
(5+5)</td><td>CO3</td></tr>
<tr><td>Q 8</td><td>(a) Describe different steps of the initial development plan. Illustrate the development strategy of oil & gas fields. List out the

(b) Discuss reservoir simulation. List out the different modeling methods in oil & gas fields.</td><td>10
(5+5)</td><td>CO4</td></tr>
<tr><td>Q 9</td><td>A gas well is produced at a rate of 18,000 ft^3/day from a gas reservoir at an average pressure of 3,500 psia and a temperature of 145°F. The specific gravity is 0.78 and the z-factor is z = 0.87. Calculate the gas flow rate in scf/day.
OR
Calculate rock and water expansion volume when the pressure falls from 1125 psig to 700 psig [MBE].
Data given:
S_{wi} = 0.205
c_f = 4x10^{-6}
c_w = 4x10^{-6}
N = 90.46 × 10^6 [STB]
Boi at 1200 psig = 1.135 [RB/STB]</td><td>10</td><td>CO4</td></tr>
<tr><td colspan="4">SECTION-C
(2Qx20M=40 Marks)</td></tr>
<tr><td>Q 10</td><td>(a) Discuss exponential Decline Curve Analysis with equation & figure.</td><td></td><td></td></tr>
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(b) **Given the following data for the sandstone oil field:**

Area = 26,500 acres
Net productive thickness = 55 ft
Porosity = 25%
Average Swi = 40%
Initial reservoir pressure, pi = 2500 psia
Abandonment pressure, pa = 500 psia
Bo at pi = 1.45 bbl/STB
Bo at pa = 1.20 bbl/STB
Sg at pa = 32%
Sor after water invasion = 22%

Calculate:

1. Initial oil in place
2. Oil in place after volumetric depletion to abandonment pressure
3. Oil in place after water invasion at initial pressure
4. Oil reserve and Recovery Factor by volumetric depletion to abandonment pressure
5. Oil reserve and Recovery factor by full water drive

20 (5+10)

CO2

Q 11

(a) Discuss elements of performance prediction. **Calculate the reduction in the pore volume** of a reservoir due to a pressure drop of 20 psi. The reservoir original pore volume is two million barrels with an estimated formation compressibility of 20×10^{-6} psi-1

(b) A hydrocarbon gas mixture has a specific gravity of 0.72. **Calculate the isothermal** gas compressibility coefficient in 2500 psia and 140°F by assuming: Z=0.78 and C_{pr}=0.3627, under following behavior:

I. An ideal gas behavior **II.** A real gas behavior

OR

(a) Discuss drive mechanism. List out the different types of drive mechanism and explain each drive mechanism with suitable figures and examples in detail.

(b) Describe the factors which influence oil recovery by water drive mechanism. **Calculate the cumulative water influx** that results from a pressure drop of 210 psi at the oil-water contact with an encroachment angle of 85°.

The reservoir-aquifer system is characterized by the following properties:

	Reservoir	**Aquifer**
Radius , ft	3400	9,000
Porosity, fraction	0.22	0.16
$C_{f,}$ psi^{-1}	5×10^{-6}	4×10^{-6}
C_w, psi^{-1}	$6 \times 10^{--6}$	5×10^{-6}
h , ft	20	25

20 (10+10)

CO4