Name: **Enrolment No:**	

UPES
End Semester Examination, December 2024

Course: Advanced Reservoir Engineering — **Semester: V**
Program: B. Tech. APE UP — **Time : 03 hrs.**
Course Code: PEAU 3044 — **Max. Marks: 100**
Nos. of page(s): 3

Instructions:
(a) All Questions are Compulsory in Sections A, B and C.
(b) Choices are given in Section B (Question 9) and Section C (Question 11).
(c) Answers must carry supporting material such as equations and diagrams.

SECTION A
(5Qx4M=20Marks)
Answer all questions

S. No.		Marks	CO
Q 1	List out the assumptions for rate equation. Illustrate the reservoir pressure monitoring.	**4**	**CO1**
Q 2	Illustrate the formula to calculate initial oil and gas in place by volumetric method.	**4**	**CO1**
Q 3	Define principle and advantages of continuity Equation.	**4**	**CO2**
Q 4	State Compressibility. Illustrate the types of compressibility.	**4**	**CO2**
Q 5	List out the advantage of pressure maintenance. Explain the factors important in WI pressure maintenance.	**4**	**CO3**

SECTION B
(4Qx10M= 40 Marks)

Q 6	(a) List out the types of gas oil ratios with suitable equations. (b) **Calculate the porosity at 6500 psi. for the given following** data: cf = 10 x 10-6 original pressure = 7500 psi original porosity = 24% current pressure = 6500 psi.	**10 (5+5)**	**CO2**

Q 7	Illustrate the water influx rate with basic equations and calculate the water influx rate e_w in a reservoir whose pressure is stabilized at 3000 psi. **Other related data is given as below:** Initial reservoir pressure = 3500 psi dN_p/dt = 32,000 STB/day B_o = 1.4 bbl/STB GOR = 900 scf/STB, R_s = 700 scf/STB B_g = 0.00082 bbl/scf , dW_p/dt = 0 B_w = 1.0 bbl/STB	**10**	**CO3**
Q 8	Describe producing a mechanism of combination drive mechanism. Write down the factors that influence oil recovery by water drive mechanism in detail.	**10**	**CO3**
Q 9	Compare simulation and simulator. Explain the uses and uses of reservoir simulation. Illustrate the two names of commercial software for static and dynamic modeling & simulation in oil & gas field. **OR** Discuss different types of models based on geometry and dimensions with suitable figures in reservoir simulation.	**10**	**CO4**
SECTION-C (2Qx20M=40 Marks)			
Q 10	(a) Discuss different rules of well spacing. Describe Direct Line Drive, Staggered Line Drive, 5-spot pattern & inverted 5-spot pattern with suitable Figures. (b) Define Initial development plan. Write down the different steps of the initial development plan.	**20 (10+10)**	**CO3**
Q 11	(a) Discuss elements of performance prediction. (b) Calculate the water breakthrough using the Sobocinski-Cornelius method for vertical well producing at 250 STB/day. **The related well and reservoir data are given below:** Oil rate, Q_o = 250 STB/day Oil column thickness, h = 50 ft Perforated interval, h_p = 15 ft Water density, ρ_w = 63.76 lb/ft^3 Oil density, ρ_o = 47.5 lb/ft^3 Oil viscosity, μ_o = 0.73 cp Oil formation volume factor, B_o = 1.1 bbl/STB Vertical permeability, k_v = 9 mD	**20 (5+15)**	**CO4**

	Horizontal permeability, k_h = 93 mD Porosity, = 13% and M = 3 **OR** (a) Discuss analogy method to estimate oil and gas reserves. (b) **Given the following data for the gas field** Area = 160 acres Net productive thickness = 40 ft Initial reservoir pressure = 3250 psia Porosity = 22% Connate water = 23% Initial gas FVF = 0.00533 ft3/SCF Gas FVF at 2500 psia = 0.00667 ft3/SCF Gas FVF at 500 psia = 0.03623 ft3/SCF Sgr after water invasion = 34% **Calculate:** 1. Initial gas in place 2. Gas in place after volumetric depletion to 2500 psia 3. Gas in place after volumetric depletion to 500 psia 4. Gas in place after water invasion at 3250 psia 5. Gas in place after water invasion at 2500 psia 6. Gas in place after water invasion at 500 psia 7. Gas reserve by volumetric depletion to 500 psia 8. Gas reserve by full water drive, i.e. at 3250 psia 9. Gas reserve by partial water drive, i.e. at 2500 psia		