Name: **Roll No:**	UPES UNIVERSITY OF TOMORROW

UPES

End Sem Examination, May-2025

Programme Name: M. Tech Petroleum Engineering **Semester: II**
Course Name: Enhanced Oil Recovery Techniques **Time: 03 hrs**
Course Code: PEAU 7009 **Max. Marks: 100**

Instructions:

- **All questions are compulsory.**
- **All the abbreviations used in the paper have their usual meanings.**
- **However, internal choice has been provided. You have to attempt only one of the alternatives in all such questions.**

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q1	Define CMC and surface-active agents	**04**	**CO1**
Q2	Define Residual resistance factor and permeability reduction factor.	**04**	**CO1**
Q3	Explain MMP, MMC and CMC	**04**	**CO2**
Q4	Why is steam preferred over hot water? Justify.	**04**	**CO2**
Q5	Discuss Mobility ratio in details along with the favorable and unfavorable conditions.	**04**	**CO2**

SECTION B
(4Qx10M=40 Marks)

Q6	Explain in detail about SAGD EOR process with neat sketch and reservoir specifications.	**10**	**CO2**
Q7	Explain in detail about *insitu* combustion method with neat sketch and reservoir specifications. **OR** Explain in detail about Huff and Puff method with neat sketch with reservoir specifications	**10**	**CO3**

Q8	Discuss Micellar flooding process and effects of brine salinity concentration on Micellar flooding process.	**10**	**CO3**
Q9	Calculate the oil recovery for the following data: a) when displacement efficiency is applied to only to the unburnt zone I and no oil is produced from the zone outside of the area swept by the combustion b) when displacement efficiency is applied to both zones I and II Oil saturation at the start of the project — 0.70 Effective rock porosity — 0.32 Pattern sweep efficiency — 0.55 Vertical sweep efficiency — 0.35 Displacement efficiency in zone I — 0.43 Oil consumed — 0.065	**10**	**CO5**
	SECTION-C **(2Qx20M=40 Marks)**		
Q10	Discuss the Drive indexes for the material balance equations. Assuming hyperbolic decline, predict the amount of oil produced for five years for the following data: well's production rate at time 0, STB/day — 100 BOPD initial nominal exponential decline rate (t = 0), 1/day — 0.5/year hyperbolic exponent — 0.9 **OR** Explain exponential decline curve method and calculate the data based on given well data: A well with an exponential decline of 1.5% per month currently produces at 300 STB/day. a) Production rate be in 2 years b) Cumulative production be in those 2 years c) Decline rate be in 2 years d) Cumulative production be from the end of Year 20 to the end of Year 21	**20**	**CO3 + CO4**

Q11	a) Discuss CO_2 miscible flooding process with a mechanism. b) Water is to be injected at an available rate of 12580 bbl/day (2000 m^3/day) for reservoir pressurization. Although the original reservoir pressure of 2143 psia was above the MMP of 2114 psia, primary depletion had reduced the reservoir pressure to 1143 psia. The decision was made to return the reservoir to its original pressure before the start of CO_2 injection. Calculate the total amount of injected water, W, and the time necessary for reservoir pressurization with following reservoir and production data: Oil formation volume factor: B_{oi} = 1.53 at initial pressure; B_o = 1.33 at actual pressure Gas formation volume factor: B_{oi} = 0.010 at initial pressure; B_g = 0.014 at actual pressure Solution ratio: R_{si} = 778 scf/bbl (137 m^3/m^3) at initial pressure; R_s = 522 scf/bbl (92 m^3/m^3) at actual pressure Cumulative oil produced: N_P = 2.516 * 10^6 bbl (0.4 * 10^6 m^3) Actual recovery factor: E_R = 15% of OOIP Cumulative water produced: W_p = 14 *10^4 bbl (2.3 * 10^4 m^3) Oil production rate (actual): q_o = 1352 STB/day (215 m^3/day) Gas Oil ratio: GOR (average) = 200 STB/bbl water production rate (actual): Q_w=126 bbl/day (20 m^3/day) Average formation volume factor: B_o = 1.43; B_g = 0.011 Average solution ratio: R_s = 650 scf/bbl (114 m^3/m^3) Original oil in place: 16.773 * 10^{16} bbl	**5+15**	**CO3 + CO5**