Name: **Enrolment No:**	UPES UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
Online End Semester Examination, May 2021

Course: Enhanced Oil Recovery Techniques **Semester: II**
Program: M.Tech (Petroleum Engg) **Time: 03 hrs.**
Course Code: PEAU 7009 **Max. Marks: 100**

SECTION A

1. Each Question will carry 5 Marks
2. Instruction: All questions are compulsory. Assume if any data missing.

S. No.	**Question**	**CO**
Q 1	Explain the terms vertical sweep efficiency, mobility and mobility ratio.	**CO1**
Q 2	Describe the forward and backward In-situ combustion process.	**CO1**
Q 3	Describe the CO_2 flooding mechanism for enhanced oil recovery.	**CO2**
Q 4	Enumerate microbial enhanced oil recovery techniques.	**CO4**
Q 5	Write single and multiple contact miscible processes for EOR.	**CO3**
Q 6	Deduce overall recovery factor, displacement and areal sweep efficiencies for an enhanced oil recovery system.	**CO1**

SECTION B

1. Each question will carry 10 marks
2. Instruction: All questions are compulsory. Assume if any data missing.

Q 7	Draw a complete flowchart of various enhanced oil recovery techniques. Explain them briefly.	**CO3**
Q 8	What are the factors involved in selection of flooding patterns? Briefly explain the flooding patterns.	**CO1**
Q 9	Derive the Buckley - Leverette equation for immiscible displacement.	**CO4**
Q 10	What is ASP flooding? Explain the displacement mechanism of alkaline flooding. Also give the screening criteria of alkaline flooding.	**CO3**
Q 11	Discuss oil recovery by wet combustion. Also differentiate between steam stimulation and steam flooding. **OR**	**CO4**

	Explain WAG injection process. Discuss the various challenges for industry associated with WAG injection technique.	
SECTION C **1. Each Question carries 20 Marks.** **2. Instruction: All questions are compulsory. Assume if any data missing.**		
Q 12	(a) An oil reservoir is being considered for further development by initiating a water flooding project. The oil–water relative permeability data indicate that the residual oil saturation is 35%. It is projected that the initial gas saturation at the start of the flood is approximately 10%. Calculate the anticipated reduction in residual oil, ΔSor, due to the presence of the initial gas at the start of the flood. **Coefficients** — **Initial Gas Saturation (S_{gi})** — **Reduction in S_{or}** a1 — 0.030517211 — 0.026936065 a2 — 0.4764700 — 0.41062853 a3 — 0.69469046 — 0.29560322 a4 — –1.8994762 — –1.4478797 a5 — $-4.1603083 \times 10^{-4}$ — $-3.0564771 \times 10^{-4}$ (b) Explain the stiles method for water flooding performances indicating the necessary assumptions. **OR** (a) Calculate the fractional recovery from the following data using stiles methods: Basic data of the reservoir:- Area of the pattern A= 300x300 m Thickness of the Payzone ,H= 10m Permeability of each layer, K = 310 md,187 md, 432 md,187 md & 64md Average porosity $\phi = 0.20$ Average oil saturation $S_o = 0.65$ Average residual oil saturation $S_{or}= 0.25$ Intial oil FVF, $B_{oi} = 1.12$ Mobility ratio,M = 1.32 Average sweep efficiency Es= 0.8 Water injection rate, $q_w = 50\ m^3/day$ Intial gas saturation,$S_{gi} = 0.14$ F(fraction of gas space fill up at first oil production increase)= 0.6 (b) Derive the equations of fractional recovery and water-oil-ratio for a heterogeneous reservoir.	**CO2**