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

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, May 2021

Course:	**Enhanced Oil Recovery**	**Semester : VIII**
Program:	**B. Tech. APE UPSTREAM**	**Time : 03 hrs.**
Course Code:	**PEAU: 4010P**	**Max. Marks: 100**

SECTION A

1. **Each Question MCQ/TF will carry 5 Marks**
2. **Instruction: Select the correct answer**

Sl. No.	Question	CO
Q 1	Tick the correct answer. **Each MCQ** carries **ONE** marks. A. The oil produced by the Reservoir drive energy is called: Ans.: (a) Improved oil recovery (b) Ultimate oil recovery (c) Primary recovery (d) None of them B. Which of the following process refers to the recovery of oil through the Injection of fluids and energy not normally present in the reservoir. Ans. (a) Enhanced Oil Recovery (b) Primary Recovery (c) Artificial Lift (d) Enhanced Oil Recovery C. Which of the following is the basis for the classification of reservoir -aquifers systems? Ans.: (a) Degree of pressure maintenance (b) Flow regimes & outer boundary conditions (c) Flow geometries (d) All of the above	**CO1**

	D. Which of the following method develops miscibility to displace oil from reservoir Ans.: (a) Displacement efficiency (b) Volumetric Sweep efficiency (c) Vertical Sweep efficiency (d) None of Them E. Trapped oil saturation can be minimize by Ans. (a) Increase Capillary number (b) Decrease Capillary number (c) Increase Viscosity of oil (d) None of the above	
Q 2	<u>Tick the correct answer. **Each MCQ** carries **ONE** marks.</u> A. Which of the following is best short-term method for improved oil recovery? Ans.: (a) Infill Drilling (b) WAG (c) SWAG (d) CO_2 Injection B. A decline curve compares these two parameters. Ans.: (a) Production and time (b) Production and permeability (c) Production and saturation (d) None of the above C. Which of the following statement is true? Ans.: (a) Mobility ratio greater than 1 is favorable for displacement (b) Mobility ratio less than 1 is favorable for displacement (c) Mobility ratio greater than 2 is favorable for displacement (d) Mobility ratio equal to zero is favorable for displacement D. What are the parameters which influences fluid characteristics? Ans.: (a) Viscous Fingering (b) Mobility & Mobility ratio (c) Permeability (d) Pore volume y & Hydrocarbon pore volume (e) a, b & d	**CO1**

	(f) All of them E. The total production from a well or field primary production and improved oil recovery that is justified by economics is known as Ans.: (a) Improved oil recovery (b) Ultimate oil recovery (c) Primary recovery (d) None of them	
Q 3	<u>Tick the correct answer. **Each MCQ** carries **ONE** marks.</u> A. Methods for Estimating of Vertical Sweep efficiency Ans.: (a) Stiles' Method (b) Dykstra & Parson's Method (c) Reservoir Simulation (d) None of them B. The Maximum water saturation at which the water phase will become immobile is known Ans.: (a) Critical water saturation (b) Connate water saturation (c) Irreducible water saturation (d) All of the above C. A type of formation whose rock properties are same in all directions is called Ans.: (a) Homogeneous formation (b) Isotropic formation (c) Anisotropic formation (d) None of the above D. Material Balance is a powerful tool that helps determine the Ans.: (a) Reserves (b) Recovery Factor (c) Drive Mechanism (d) All of them	**CO2**

	E. Which of the following is true about benefits of water flooding. Ans.: (a) Water is easily available (b) Water is efficient displacing (c) Water flooding requires low CAPEX & OPEX (d) All of the above	
Q 4	Tick the correct answer. **Each MCQ** carries **ONE** marks. A. In _____ both injection and production wells are injected with superheated steam. Ans.: (a) Steam flood (b) Water flood (c) Polymer flood (d) None of the above B. In _____, the flame moves from injection well towards the producing well. Ans.: (a) Forward combustion (b) Reverse combustion (c) Discontinuous combustion (d) None of the above C. Which of the following is true about the gas injection? Ans.: (a) Nitrogen and flue gas provide gas drive (b) It enhance gravity drainage (c) Both (a) and (b) (d) None of the above D. CO_2 flooding method is used for Ans.: (a) Heavy crude oil (b) Waxy crude oil (c) Medium and light crude oil (d) None of them E. Micellar polymer is also known as Ans.: (a) Micro-emulsion flooding (b) Low tension flooding (c) Chemical flooding (d) All of the above	**CO3**

Q 5	Tick the correct answer. **Each True/False** carries **ONE** marks. A. MEOR is family of microbial processes which involves injection of microbes & nutrients to improve oil production from the well/ reservoir. (True/False) B. Low temperature microbes are anaerobic, thermophilic and halophilic (26% salinity).(True/False) C. Incubation period of high temperature microbes for peak growth is 20 days. (True/False) D. Microbes create bio-chemicals, which reduce IFT, increase water mobility and decrease the oil mobility. (True/False) E. Microbial solution contains live microorganisms, which cannot transport themselves in different directions where they are most needed. (True/False)	**CO4**
Q 6	Tick the correct answer. **Each True/False** carries **ONE** marks. A. Dual Porosity Simulators can be used for Naturally Fractured Reservoirs. (True/False) B. CMG-IMEX (Conventional "Black Oil") simulator can model the flow of water, oil, and gas, and can account for pressure-dependent solubility of gas in oil, but they cannot model changes in oil and gas composition. (True/False) C. In Eclipse 100 Software, under SOLUTION section specifies output of initial conditions (time > 0). (True/False) D. Reservoir Simulation of highly viscous oil reservoirs can perform by using Eclipse 500 and Stars Simulator. (True/False) E. Simulator selection depends on Types of Simulator, Phases, Geometry and Dimensionality, (True/False)	**CO6**
	SECTION B **1. Each question will carry 10 marks** **2. Instruction: Write short / brief notes**	
Q 1	(a) Define the applications of Polymer. Write down the names of commercial polymer. Write down the parameters on which viscosity of polymer solution depends. **(5 Marks)** (b) Define Coning and Cusping. Write down the major problems caused by water during oil operations. Write down recommended parameters for injection water. **(5 Marks)**	**CO2**

Q 2	Define recent advances in EOR. Explain CHOPS (Cold Heavy Oil Production with Sand), GAGD (Gas Assisted Gravity Drainage), THAI (Toe-to-Heel Air Injection) and VAPEX (Vapor extraction) methods with suitable figures **(10 Marks)**	**CO3**
Q 3	(a) Define different rules of Well Spacing. Explain different types of Well Pattern with suitable Figures. **(5 Marks)** (b) Calculate the Oil Recovery for Given Data. Oil saturation at the start of the project $S_O = 0.75$ Effective Rock Porosity $\phi = 0.35$ Pattern Sweep Efficiency $E_P = 0.51$ Vertical Sweep Efficiency $E_I = 0.32$ Displacement Efficiency in Zone I $E_{du} = 0.45$ Oil Consumed $S_{Ocons} = 0.062$ **(5 Marks)**	**CO3**
Q 4	(a) Define Microbial Method. Define the types of microbes cultured in laboratory. Describe Huff and Puff Microbial Method in detail. **(5 Marks)** (b) Explain advantages of Vibration Stimulation & Enzyme EOR. **(5 Marks)**	**CO4**
Q 5	(a) Explain applications of different types of simulators in different EOR methods. Describe the Pre and post processor files of Builder in CMG Black oil simulator **(5 Marks)** (b) Defining values one cell at a time and set 10 cells to have length of 1000 feet using **DX** Keyword. **(5 Marks)** **OR** Write down the different keywords (in detail) used in Eclipse for RUNSPEC, GRID, EDIT, PROPS, REGIONS, SOLUTIONS, SUMMARY, and SHEDULE Sections. **(10 Marks)**	**CO6**

SECTION C

1. Each Question carries 20 Marks.
2. Instruction: Write long answer.

Q 1	(a) Explain Screening criteria and applications of Steam injection Describe Steam injection method with case study of successful implementation in any Indian or Foreign Oil Field. **(10 Marks)** (b) Calculate the oil consumed after 5 years of in situ combustion developed as a primary recovery method. The oil reservoir (SG=0.950) has 157 x 10^6 bbl OOIP reserve, and the combustion process is sustained by the injection of 700 x 10^3 ft^3 air/day through each of the 12 injection wells. **(10 Marks)** **OR** (a) Explain Screening criteria and applications of CO2 flooding process. Describe limitations of CO2 flooding method with case study of successful implementation of N2 flooding method in any Indian or Foreign Oil Field. **(10 Marks)** (b) Calculate the CO_2 static wellhead pressure $P_{w,}$ when the static bottom hole Pressure is the miscibility pressure of 2114 p_{sia}. The following additional information is available: Bottom Hole Temperature T_R = 170° F (76° C) Surface Temperature T_S = 70° F (21° C) CO_2 specific gravity SG=1.529 (air=1) CO_2 deviation factor Z = 0.56 is assumed to be practically Constant between reservoir pressure and temperature range Reservoir depth D = 4264 ft (1300 m) **(10 Marks)**	**CO5**