Name: **Enrolment No:**	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2022

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

Instructions: All question are compulsory.

a. Answers must carry the supporting material such as equations and diagrams
b. Abbreviations used in the questions are standard and have their usual meaning
c. Make appropriate assumptions where data is not supplied

SECTION A
(5Qx4M=20Marks)

S. No.	Statement of question	Marks	CO
Q 1	Distinguish between in IOR & EOR Write down the concept and benefits of Enhanced Oil Recovery processes.	**4**	**CO1**
Q 2	Write down the selecting criteria of different types of EOR methods.	**4**	**CO1**
Q 3	Explain viscous fingering, residual oil saturation, sweep efficiency and displacement efficiency with suitable figures.	**4**	**CO1**
Q 4	Discuss drive mechanism. Explain different types of drive mechanism with suitable figures.	**4**	**CO1**
Q 5	Explain coning and channeling. Write down the types of coning. Illustrate the reasons and remedies of excessive water in field.	**4**	**CO2**

SECTION B
(4Qx10M= 40 Marks)

Q 6	(a) Explain water quality. Write down the major problems caused by water during oil operations. Write down recommended parameters for injection water. **(5 Marks)** (b) Discuss Polymer flooding method. Write down the parameters on which viscosity of polymer solution depends. Describe the applications of Polymer. **(5 Marks)**	**10**	**CO2**
Q 7	(a) Discuss well spacing. Illustrate the different rules of well spacing. Explain different types of well pattern with suitable figures. **(5 Marks)** (b) Explain ASP flooding method. Describe the applications of ASP flooding methods with case study. **(5 Marks)**	**10**	**CO3**

Q 8	(a) Describe the criteria of simulator selection. Write down the name of commercial simulators for different EOR recovery processes. Write down the name of software for seismic to simulation study. **(5 Marks)** (b) Explain different deliverables for Geo-cellular modeling in Petrel. Describe the input and output files in Black Oil IMEX Simulator of CMG. **(5 Marks)**	**10**	**CO6**
Q 9	(a) Explain major applications areas of MEOR. List types of microbes cultured in laboratory. Illustrate Microbial products and write down the two Indian patents of MEOR. **(5 Marks)** (b) Describe the applications of Enzyme EOR & Nanotechnology in EOR. **(5 Marks)** **OR** (a) Illustrate the need of MEOR. Describe MEOR technology. Describe Huff and Puff Microbial method. List microbial products and their contributions to EOR. . **(5 Marks)** (b) Describe advances in EOR. Explain CHOPS (Cold Heavy Oil Production with sand) and Vapor (VAPEX) methods. **(5 Marks)**	**10**	**CO4**
SECTION-C **(2Qx20M=40 Marks)**			
Q 10	(a) Discuss CO_2 flooding method and its limitations. Describe case study of CO_2 flooding method of any Indian or Foreign Oil Field. **(10 Marks)** (b) Calculate the CO_2 static wellhead pressure $P_{ts,}$ when the static bottom hole pressure is the miscibility pressure of 2324 psia. The following additional information is available: Bottom hole temperature TR = 170^O F (76^O C) Surface temperature TS = 70^O F (21^O C) CO2 specific gravity SG = 1.429 (air = 1) CO2 deviation factor Z = 0.49 is assumed to be practically constant between reservoir pressure and temperature range Reservoir Depth D = 4264 ft (1300 m) **(10 Marks)**	**20**	**CO3**
Q 11	(a) Describe Fire flooding method in detail with suitable diagram. Explain applications and limitation of fire flooding method with case study of successful implementation in any Indian 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. **Hint:** Minimum air necessary to burn 1 pound of fuel is 186 scf/lb_m and Coke's specific gravity (SG)= 1.2 and density of water = 62.55lb/ft^3. **(10 Marks)** **OR** (a) Describe applications and limitation of Steam Flood process with case study of successful implementation in any Indian/Foreign Oil Field. **(10 Marks)** (b) A Combustion test in confined pattern conducted on a depleted oil reservoir with a current oil recovery of 15 percent. Estimate the final oil recovery expected after the commercial development of the in situ combustion method given the following: Confined acre 1.35 acres Net thickness 25 ft. Effective porosity 30% Irreducible water saturation 24% Oil formation volume factor Initial 1.18 Current 1.10 Cumulative oil production of the central Well P, as the effect of combustion ΔN_c=12,250 bbl **(10 Marks)**	**20**	**CO5**