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UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, April' 2017

Program Name: B. Tech. APE UP **Semester – VIII**
Course Name : Enhanced Oil Recovery **Max. Marks: 100**
Course Code : PTEG 427 **Duration: 3 Hrs.**
No. of page/s: 4

Instructions:

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

Answer all five questions. Each Question carries 4 Marks **5x4= 20 Marks**

Question 1 Why EOR & Why not Enhanced Oil Recovery? What are the different parameters on which Recovery Efficiency depends? (4 Marks)

Question 2 Write short notes on fluid pressure, rock pressure Buckley-Leverette, and Stiles Methods with suitable Figure. (4 Marks)

Question 3 Explain coning and Channeling with suitable Figures. What are methods to identify the coning potential? What are the reasons and Remedies of excessive Water in field? (4 Marks)

Question 4 What is Recovery Factor? What are the reasons for low oil production? (4 Marks)

Question 5 What is Hall plot? Explain in detail. What are the advantages and disadvantages of Hall plot? (4 Marks)

SECTION B

Answer all five questions. Question No. 1 to 4 are compulsory. Answer any one question from Questions No.5. Each Question carries 8 Marks **5x8= 40 Marks**

Question 1 What are limitations and problems in CO2 Flooding? Write down the most suitable Flooding Method for deep reservoirs. (8 Marks)

Question 2 What is Surfactant Flooding Process? Write down the Screening criteria and applications of surfactant and Microbial Flooding Methods. (8Marks)

Question 3 What is water quality? Write down the major problems caused by water during oil operations. Write down recommended parameters for injection water. Explain Relative Plugging Index. (8 Marks)

Question 4 What are the different steps in Production, Injection, Field and Pattern monitoring? What are the advances in EOR? (8Marks)

Question 5 What are the screening criteria for selecting Thermal and Alkaline methods for exploiting the undrained oil from the reservoir. What are the types of simulator used in Thermal and chemical EOR Methods? (8 Marks)

OR

Question 5 Given

Oil saturation at the start of the project	S_O	=	0.70
Effective Rock Porosity	ϕ	=	0.32
Pattern Sweep Efficiency	E_P	=	0.55
Vertical Sweep Efficiency	E_I	=	0.35
Displacement Efficiency in Zone I	E_{du}	=	0.43
Oil Consumed	S_{Ocons}	=	0.065

Calculate the Oil Recovery. (8 Marks)

SECTION C

Answer all two questions. Question No. 1 is compulsory. Answer any one question from Questions No.2. Each Question carries 20 Marks 2x20 = 40 Marks

Question 1 (20 Marks)

1-a What are the types of Combustion techniques? Explain in detail. Write down the mechanism of Combustion. What are the limitations and problems in In Situ Combustion Method? (10 Marks)

1-b A Combustion test in confined pattern was 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	1.45 acres	
Net thickness	50 ft	
Effective porosity	35%	
Irreducible water saturation	26%	
Oil formation volume factor		
Initial	1.22	
Current	1.15	
Cumulative oil production of the central		
Well P, as the effect of combustion	ΔN_c=14.250 bbl	(10 Marks)

Question 2 **(20 Marks)**

2-a Write down the correlations to estimate Oil Recovery Factors under Solution gas drive (API Study) and Water drive (API Study) and Guthrie-Greenberger Study. (10 Marks)

Sandstone oil reservoir has the following reservoir and fluid characteristics:

ϕ = 35%	Bo = 1.126 RB/STB	k=500 mD	h=115 ft
S_w=24%	P_b = 2550 psig	μ_w = 0.7 cp	μ_b = 3.5 cp

The initial reservoir pressure is 2550 psig and abandonment pressure has been calculated 1000 psig. Determine expected recovery efficiency for depletion drive condition.

2-b A tilted linear reservoir is under consideration for water flooding. The rock and

Fluid properties are given below:

Cross-sectional area A	= 32,550 ft^2
Absolute permeability k	= 60 md
Dip angle	= 20°
Water density ρ_w	= 62 lb/ft^3
Oil density ρ_o	= 35 lb/ft3
Water viscosity μ_w	= 0.7 cp
Oil viscosity μ_o	= 3.1 cp

k_{rw} @ S_{or}	= 0.35
k_{ro} @ S_{wi}	= 1.00
Water-injection rate	= 700 bbl/day

Calculate the critical water injection rate for water displacing oil updip.

(10 Marks)

OR

2-a Write down the stepwise procedure for calculating Recovery through Water Flooding. What is Dykstra Parson Method? (10 Marks)

2-b A vertical; well is drilled in an oil reservoir by a gas cap. The related well and reservoir data are given below (10 Marks)

Horizontal and vertical permeability, i.e. k_h, k_v	=250mD
Oil relative permeability, k_{ro}	=0.70
Oil density, ρ_o	=45.5 lb/ft^3
Gas density, ρ_g	=3.5 lb/ft^3
Oil viscosity, μ_o	=0.55 cp
Oil formation volume factor, B_o	=1.215 bbl/STB
Oil column thickness, h	=45 ft
Perforated interval, h_p	=18 ft
Depth from GOC to top of perforations, D_t	=18 ft
Wellbore radius, r_w	=0.24 ft
Drainage radius, r_e	=5500 ft

Using the Meyer and Gardner relationships, calculate the critical flow rate.