UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2021

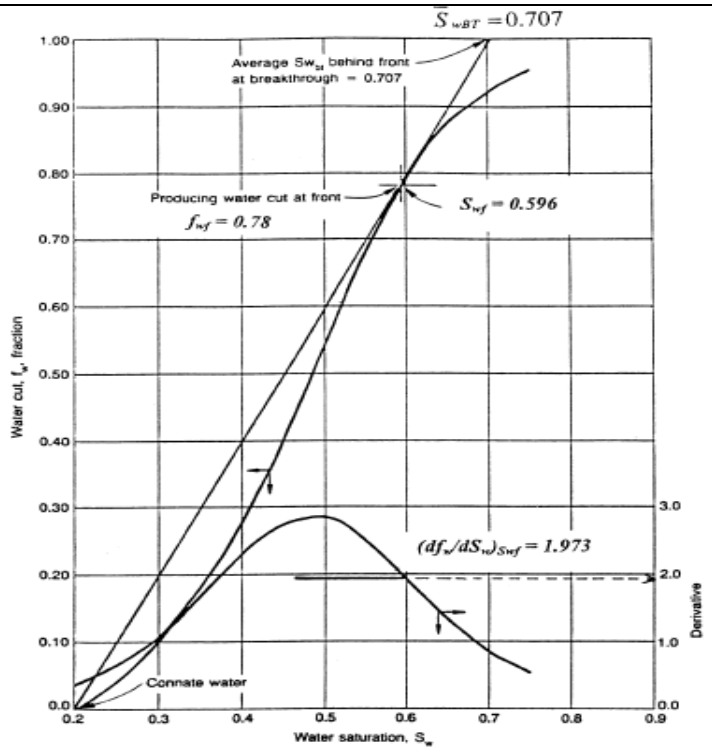
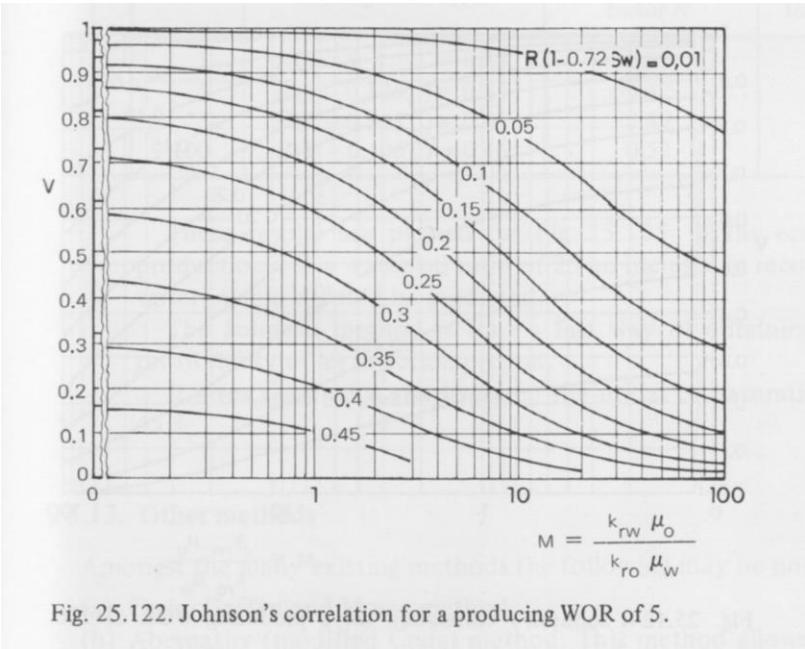
Course: Enhanced Oil Recovery **Semester: VII**
Program: B.Tech APE Gas **Time: 03 hrs.**
Course Code:PEAU4010 **Max.Marks:100**

SECTION A
(Scan and Upload) **(5Qx4M = 20Marks)**

		Marks	COs
Q 1	List the different types of regular injection patterns and which is more preferable and why?	**4M**	**CO1**
Q 2	Explain the analysis of water flood after breakthrough with a neat diagram.	**4M**	**CO2**
Q 3	Illustrate the factors that affect areal displacement efficiency?	**4M**	**CO2**
Q 4	For a given steam injection rate, what are the field methods to reduce the heat loss from the well bore?	**4M**	**CO3**
Q 5	Describe the two principal types of polymers being used in polymer flooding for field applications.	**4M**	**CO4**

SECTION B
(Scan and Upload) **(4Qx10M = 40Marks)**

Q 1	For the linear reservoir system, calculate the following when the water saturation at the producing well reaches 0.56.Pore volume is 677000 bbl. a. reservoir water cut in bbl/bbl b. surface water cut in STB/STB c. reservoir water-oil ratio in bbl/bbl d. surface water-oil ratio in STB/STB e. average water saturation in the swept area f. pore volumes of water injected g. cumulative water injected in bbl	**10M**	**CO1**

			
Q 2	A reservoir is characterized by the following parameters. Initial oil in place is 15 MMSTB. Permeability variation factor is 0.8. Mobility ratio is 4.0.Initial water saturation is 0.35.Predict the cumulative oil production as a function of the producing water to oil ratio for 5, 25, and 100.  Fig. 25.122. Johnson's correlation for a producing WOR of 5.	**10M**	**CO2**

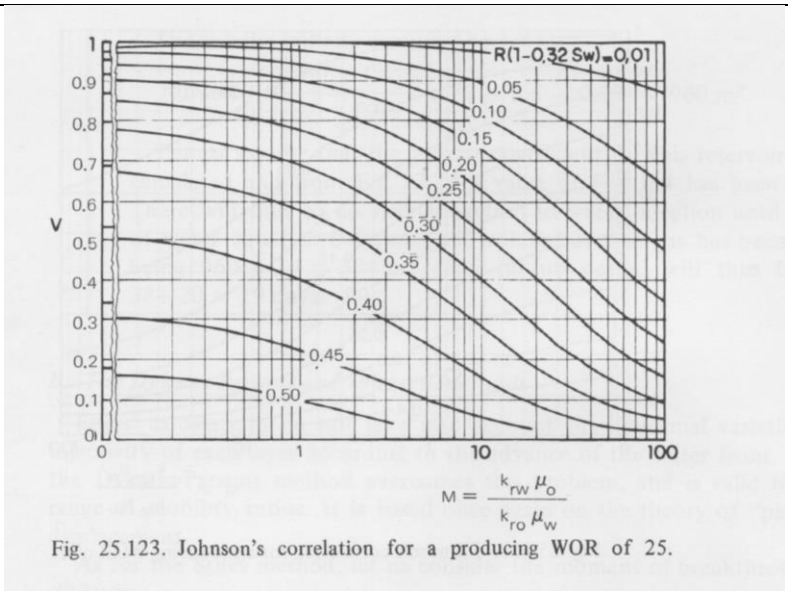


Fig. 25.123. Johnson's correlation for a producing WOR of 25.

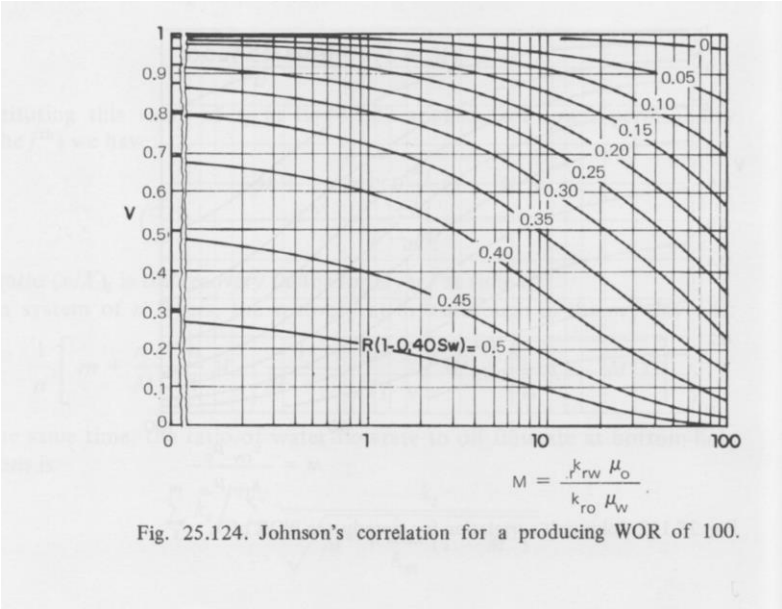
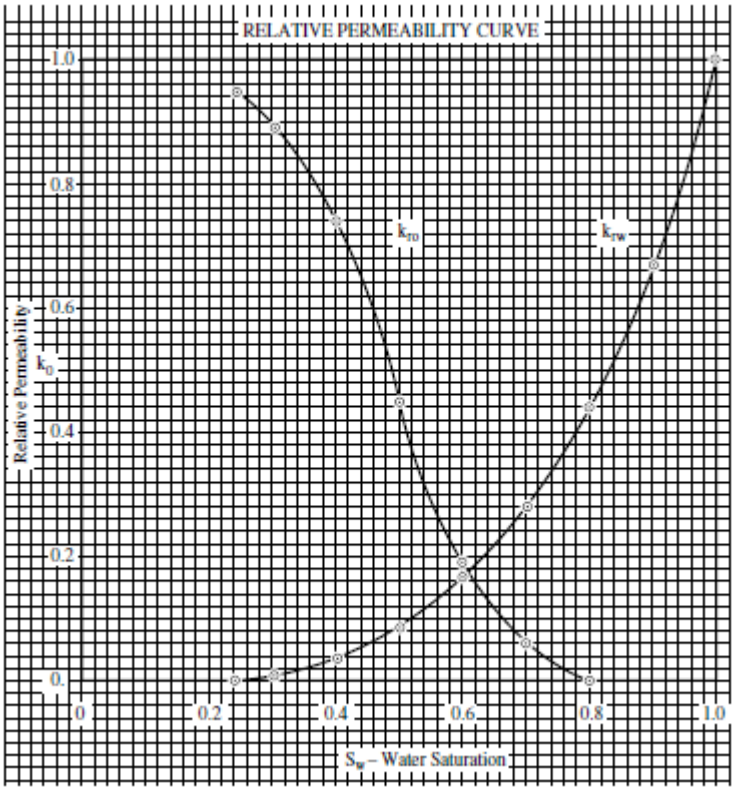


Fig. 25.124. Johnson's correlation for a producing WOR of 100.

Q 3	What is Minimum Miscibility Pressure? Using a neat sketch, explain how it is measured.	**10M**	**CO3**
Q 4	Explain the different displacement mechanisms regarding oil displacement by alkaline flooding in detail.	**10M**	**CO4**
	SECTION C		
	(Scan and Upload)	**(2Qx20M = 40Marks)**	
Q 1	a) Use the relative permeability as shown in below Figure to plot the fractional flow curve for a linear reservoir system with the following properties: Dip angle=0, Absolute permeability= 50 md		

	B_o=1.22 bbl/STB, B_w=1.55 bbl/STB ρ_o= 45 lb/ft^3, ρ_w=64.0 lb/ft^3 μ_w=0.5 cp, Cross-sectional area A = 25,200 ft^2 Perform the calculations for the following values of oil viscosity 5 cp. Document the results graphically and explain the effect of oil viscosity on fractional water cut.  b) Saturated steam at 0.7 atm and 90°C condenses on a vertical pipe of 2 cm outside diameter and 40 cm length. The average condensation heat transfer coefficient on the tube is 12000 W/m^{2}K. The outside surface temperature of the pipe is maintained constant at 85°C.The enthalpy values for saturated steam and condensate are 2660 kJ/kg and 375 kJ/kg, respectively. Calculate the rate of steam condensation in kg/h.	**(15+5) 20M**	**CO2 & CO3**
Q 2	a) Explain the zones in polymer flooding by a schematic cross section view of a polymer injection. b) Compare, at a water cut of 95 percent, the final oil recovery factors expected through conventional water injection and polymer water flooding. The reservoir properties are Shown in Table.	**(10+5+5) 20M**	**CO4**

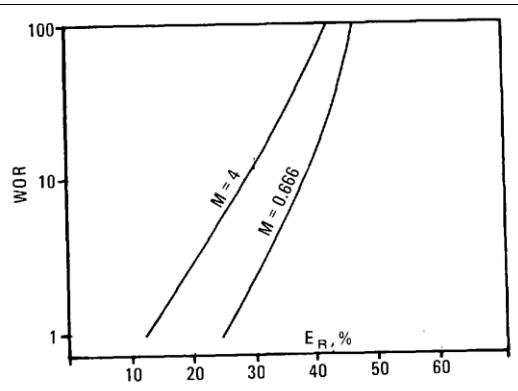


Fig. 6-12 Water-oil ratio versus oil recovery

Table: Properties of Reservoir

Irreducible water saturation	0.20
Relative permeability for water	0.18
Relative permeability for oil	0.60
Water viscosity	0.473 cp
Oil viscosity	6.4 cp
Permeability variation	0.5
Formation volume factor for oil	1.05
Resistance factor	6

c) Explain the guidelines for polymer application?

(Or)

a) Explain how the microbial processes proceeding in MEOR can be classified according to the oil production problem in the field.
b) Discuss the environmental risks associated with the implementation of EOR projects.

(10+10) 20M | **CO4**