UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2023

Program Name: B.Tech APE Gas   Semester   : VII
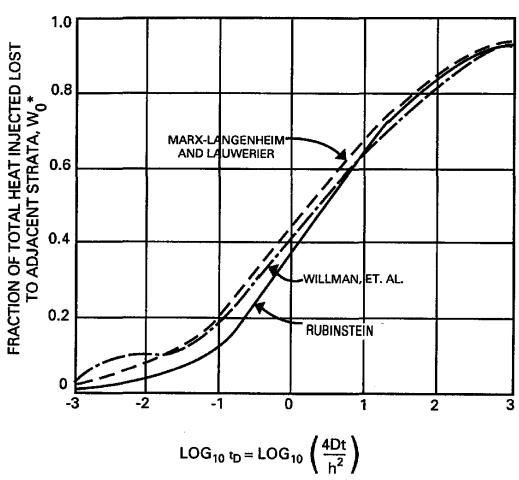Course Name : Enhanced Oil Recovery   Time   : 3hrs
Course Code   : CHGS3014P   Max. Marks: 100
Nos. of page(s):   03

Section A
(4x15=60 Marks)

S. No.		Marks	CO
Q 1	a) Discuss the screening criteria for the Insitu Combustion process. b) The oil and water relative permeability curves for a particular water flood are given as follows. The relative permeability data given by the following expression: $k_{rw}=0.4(1-S_{wd})^2$ $k_{ro}=0.3(S_{wd})^2$ where $S_{wd}=(S_w-S_{wi})/(1-S_{or}-S_{wi})$ where k_{rw}: Water relative permeability, k_{ro}: Oil relative permeability, S_w: Water Saturation, S_o:Oil saturation Soi=0.75, Swi=0.25, Sor=0.35 Other pertinent data are given below. Distance between the wells=2700 ft Cross-sectional area for the line drive=3000 ft^2 Porosity=0.25, Initial S_w= 0.20, Oil viscosity=3.0 cp, Water viscosity=1.0 cp, Constant water injection rate=250 bbl/day, slope a) Calculate and plot the fraction flow curve for the water phase without gravity and capillarity. b) Estimate the total flood pattern pore volume, bbl.	15	CO1 & CO2
Q 2	Heat at an amount of 14 MM Btu/hr is injected as wet steam into a formation 70 ft thick. The formation temperature is 100 °F, steam quality is 72 percent, and steam injection pressure is 760 psi at the sand face. Estimate the net heat gained by the formation, the heat lost to the overburden, and the heated radius. Calculate the vertical heat loss to adjacent strata if the thermal diffusivity $D = 0.96$ ft^2/day. From steam tables, at p; = 760 psia and 72% steam quality, • the wet-steam enthalpy is 1004.5 Btu/lbm • the water enthalpy at 100ºF is 67.9 Btu/lbm The steam temperature at 760 psia is 512.3ºF.The heat capacity of the rock is given as 36 Btu/ft^3 ºF	15	CO3
Q 3	a) Compare steam flooding and In situ Combustion in terms of Thermal efficiency and other factors. b) Classify miscible displacement processes and describe them with a neat sketch.	15	CO3
Q 4	a) Enumerate and explain the special aspects to consider as screening criteria for alkaline flooding. b) What are the components of the micellar solution and how does it operate with reservoir fluids.	15	CO4
	Section B		

	(2x20=40 Marks)		
Q 5	a) A steam generator produces steam of 85% quality at 1000 psia saturation pressure consuming 911 lb/hr of fuel oil with 19,800 Btu/lbm heat of combustion. The feedwater rate is 150 m³/day at 60°F. Find the heat loss and the efficiency of the generator. Wet steam enthalpy at 1000 psia saturation pressure, hf=542.4 Btu/lbm, hfg=649.4 Btu/lbm Enthalpy of feed water at 60°F is 28.06 Btu/lbm b) Describe the working, principle, advantages, and disadvantages of wet steam generators to produce steam.	**20**	**CO3**
Q 7	a) Describe polymer-augmented water flooding and surfactant flooding. b) Enumerate the physical and chemical characteristics of polymers.	**(10+10)** **20**	**CO4**

$$LOG_{10} \, t_D = LOG_{10} \left(\frac{4Dt}{h^2} \right)$$