Name: **Enrolment No:**	UPES

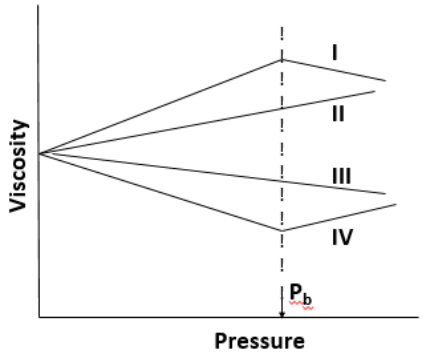
UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination December-2021

Course: Reservoir Engineering-I
Program: BT-APEU
Course Code: PEAU 3002

Semester: V
Time 03 hrs.
Max. Marks: 100

Instructions: All questions are compulsory. There is no overall choice. However, internal choice has been provided in some questions. You have to attempt only one of the alternatives in all such questions.

SECTION A

S. No.		Marks	CO
Q 1	"When a wetting and a non-wetting phase flow together in a reservoir rock, each phase follows separate and distinct paths." Explain this statement with the help of a graph.	**4**	CO1
Q 2	The reservoir fluid has an oil formation volume factor of 1.552 bbl/STB at the initial reservoir pressure 5000 psia and 1.620 bbl/STB at the bubble point pressure of 3000 psia. If the reservoir produced equivalent to last three digits of your roll no multiplied with 10000 STB of oil when the pressure dropped up to 3000 psia, calculate the initial oil in place (MMSTB).	**4**	CO6
Q 3	Explain the capillary hysteresis	**4**	CO2
Q 4	Which of the following curves represents behavior of oil viscosity as a function of pressure in an under saturated oil reservoir. Give a brief explanation. 	**4**	CO3
Q 5	Explain briefly about the flow geometry in the reservoir	**4**	CO4

SECTION B

Q 6	a. A glass capillary tube is placed in water of density 62.4 lb/ft3. The water rises in the capillary up to a height of 4.2 cm. Find the height to which the same water will rises in another capillary having half area of cross section. b. An under saturated oil reservoir having 5000 psi initial reservoir pressure has a bubble point pressure 3500 psi. The reservoir has produced about 2% of initial oil in place and reservoir pressure dropped to 4000 psi. Find out if any change in initial oil saturation is there and in what percentage. Explain the answer with reasons	**10**	CO1
Q 7	State various primary drive mechanism possibly may exist in a petroleum reservoir. Explain the expected production and pressure profile during the producing life of reservoir under different driving mechanism. Find out the drive mechanism of an oil reservoir, producing oil with constant producing GOR and no water cut with pressure decline. However, after some time of initial production, continuous increase in the producing GOR has been observed under constant pressure drop. Explain your answer with reasons.	**10**	CO5
Q 8	Drive an equation for Harmonic averaging of permeability of a heterogeneous reservoir Calculate the average permeability of a formation that consists of four beds in series, assuming it radial system with rw=0.3 and re = 1450 ft. the permeability of each bed is given in the following table	**10**	CO2
Q 9	Derive equations for determining the following parameters of a natural gas • Apparent molecular weight • Specific gravity • Density • Gas formation volume factor, Bg Or Explain the Following • Crude oil gravity (^{0}API) • PT diagram of volatile oil • Gas Condensate reservoir • Constant Composition Expansion Studies	**10**	CO3

Bed	Length of bed Linear or radial	k, md
1	400	70
2	250	400
3	300	100
4	500	60

SECTION-C

Q 10	A. Derive an expression for the steady state inflow of slightly compressible fluid into a vertical well placed at the center of a reservoir. Assume that only single fluid phase is flowing under isothermal condition. B. Calculate the flow rate of a gas, flowing in a linear reservoir system having a length of 2000 ft at 150°F. The upstream and downstream pressures are 2000 and 1800 psi, respectively. The system has the following properties: Width = 300 ft, h = 15 ft, k = 40 md φ = 15%, z factor = 0.78, μg = 0.0173.	20	CO4
Q 11	Describe in details the production decline analysis and its controlling factors A newly discovered reservoir is producing oil with an exponential decline of 1.8 %/month at 400 STB/day. Considering the 360 days in a year please find out: Its rate of production at the end of two years Its cumulative production in those two years Or a. Derive the Material Balance equation applied for dry gas reservoirs with no water encroachment and production and also drive Material Balance equation for dry gas with water drive reservoir. (7 Marks) b. A volumetric gas reservoir with bulk volume 20000-acre ft has an initial reservoir pressure 3000 psi and temperature 200 ^{0}F. The porosity and initial water saturation of the reservoir is 25% and 30% respectively. Calculate the original gas in place (OGIP) in standard cubic feet if the Z factor at 3000 psi is 0.8. (7 Marks) c. The abandonment pressure of the above reservoir is 500 psi and Z factor at this pressure is 0.96; using material balance equation, calculate the recovery factor at abandonment pressure. (6 Marks)	20	CO6