Name: Enrolment No:	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2020

Programme Name: M.Tech PE **Semester : I**

Course Name : Reservoir Engineering **Time : 03 hrs**

Course Code : PEAU7002 **Max. Marks: 100**

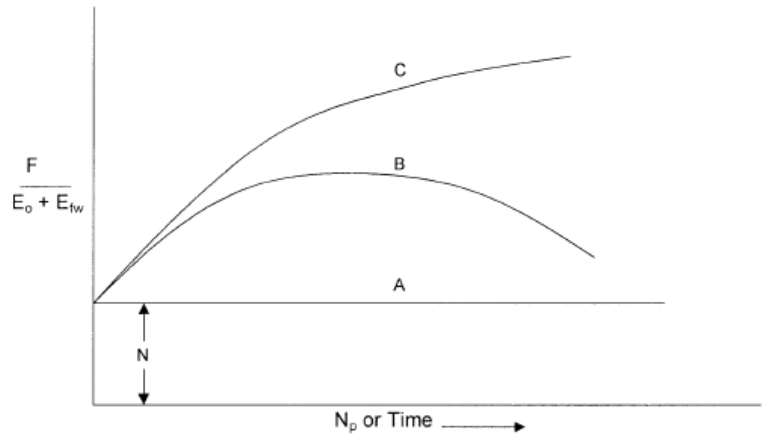
Instructions :

- All questions are compulsory. However, internal choice has been provided. You have to attempt only one of the alternatives.
- Write the answers on an A4 sheet with your name and roll number mentioned on each page. Pl scan properly so as the answers are visible.
- Submit well within time limit.

SECTION A

(5 x 6 marks = 30 marks)

S. No.	Questions of three mark each. Chose the correct answer/answers.	**Marks**	**CO**
1	1. The proper ranking of average (typical, not exceptional) oil reservoir recovery efficiency (from lowest to highest) by drive mechanism is A. solution-gas drive; rock-and-fluid expansion drive; water drive; expanding gascap drive B. solution-gas drive; expanding gas-cap drive; water drive; gravity drainage drive C. rock-and-fluid expansion drive; solution-gas drive; water drive; expanding gascap drive D. rock-and-fluid expansion drive; expanding gas-cap drive; gravity-drainage drive; water drive 2. The API of freshwater is A.1 B.10 C.20 D.100	**5**	**CO5**
2	Differentiate between the reservoirs (A,B,C) based on the graph below.	**5**	**CO5**

			
3	An oil reservoir exists at its bubble-point pressure of 3000 psia and temperature of 160°F. The oil has an API gravity of 42° and gas-oil ratio of 600 scf/STB. The specific gravity of the solution gas is 0.65. The following additional data are also available: • Reservoir area = 640 acres • Average thickness = 10 ft • Connate water saturation = 0.25 • Effective porosity = 15% • Oil formation Volume Factor= 1.306bbl/STB Calculate the initial oil in place in STB.	**5**	**CO6**
4	Define imbibition and drainage.	**5**	**CO2**
5	a) The Cricondentherm is defined as the minimum temperature above which liquid cannot be formed regardless of pressure. b) For a particular gas and crude oil to exist at a constant temperature, the gas solubility decreases with pressure until the saturation pressure is reached. c) The process of generating the capillary pressure curve by displacing the wetting phase with the nonwetting phase is called the drainage process	**5**	**CO1**
6	An incompressible fluid flows in a linear porous media with the following properties. L = 2500 ft h = 30 ft width = 500 ft k = 50 md f = 17% m = 2 cp inlet pressure = 2100 psi Q = 4 bbl/day r = 45 lb/ft3 Calculate and plot the pressure profile throughout the linear system.	**5**	**CO4**
SECTION B (50 marks)			
Q 2	The phase diagram of an oil reservoir is characterized by the quality lines which are closer to the dew point curve. Identify the type of the above mentioned reservoir and define its properties. How will the phase behavior change with decrease in pressure? OR Draw and analyze the pressure–temperature phase diagram for a gas condensate reservoir indicating the following: • Bubble point and dew point lines • Critical point • Lines of constant proportions of liquid-gas	**10**	**CO3**

	• Region of retrograde condensation		
Q 3	Define the following terms: a. Bubble point pressure b. Saturation c. Wettability d. Connate water saturation e. Residual oil saturation.	**10**	**CO2**
Q 4	An oil well in the Nameless Field is producing at a stabilized rate of 600 STB/day at a stabilized bottom-hole flowing pressure of 1800 psi. Analysis of the pressure buildup test data indicates that the pay zone is characterized by a permeability of 120 md and a uniform thickness of 25ft. The well drains an area of approximately 40 acres. The following additional data is available: rw = 0.25 ft A = 40 acres Bo = 1.25 bbl/STB μo = 2.5 cp Calculate the pressure profile (distribution) and list the pressure drop across 1 ft intervals from rw to 1.25 ft, 4 to 5 ft, 19 to 20 ft, 99 to 100 ft, and 744 to 745 ft.	**10**	**CO4**
Q5	Determine the MBE as staright line for volumetric underdaturated reservoir in which secondary recovery is not applied.	**10**	**CO5**
Q6	Elaborate the assumptions of Decline Curve Analysis. Graphically explain the different types of Decline curve.	**10**	**CO6**
SECTION-C (20 marks)			
Q7	A combination-drive reservoir contains 20 MMSTB of oil initially in place. The ratio of the original gas-cap volume to the original oil volume, i.e., m, is estimated as 0.15. The initial reservoir pressure is 3000psia at 150°F. The reservoir produced 2.2 MMSTB of oil, 1900 MMscf of 0.84 specific gravity gas, and 100,000 STB of water by the time the reservoir pressure dropped to 2900 psi. The following PVT is available: **3000 psi** **2900 psi** Bo, bbl/STB 1.58 1.48 Rs, scf/STB 1040 850 Bg, bbl/scf 0.00080 0.00092 Bt, bbl/STB 1.58 1.655 Bw, bbl/STB 1.000 1.000 The following data are also available: Swi = 0.20; cw = 1.5 × 10−6 psi−1; cf = 1 × 10−6 psi−1 Calculate: a. Cumulative water influx b. Net water influx c. Primary driving indexes at 2900 psi. OR Treating the reservoir pore as an idealized container derive the volumetric balance expression which occurs naturally during the productive life of a reservoir.	**20**	**CO6**

	Determine the relative magnitude of each of the driving mechanisms and its contribution to the production in a combination drive mechanism.		