Name:
Enrolment No:

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2019

Programme Name: B.Tech., APE Gas **Semester :** V
Course Name : Production Engineering **Time :** 03 hrs
Course Code : PEAU 3008 **Max. Marks :** 100
Nos. of page(s) : 2

SNo	Answer all the questions	Marks	CO
	SECTION A		
Q 1	What is the principle of working of a desalter?	**5**	**CO-I**
Q 2	List various internal components used in two-phase separators.	**5**	**CO-II**
Q 3	Calculate a well's skin effect due to radial damage if the permeability impairment is k/ks=5 fold, the wellbore radius is 0.328 ft, drainage radius is 3000 ft and the penetration distance is 0.172 ft.	**5**	**CO-III**
Q 4	Classify Rock System and their nature based on Brinell Hardness (BHN).	**5**	**CO-IV**
	SECTION B		
Q 5	Establish the design parameters for a vertical heater-treater given the following data: Q_o = 2000 BOPD; P_o = 35 psig; Wc_{inlet} = 15%; Wc_{outlet} = 1%; $T_o = 80^0$F; $\Upsilon_o = 34^0$API; Υ_w = 1.07; μ = 10 cp; and tr_o = 20 min; Operating Temperature = 130^0F at which $\Upsilon_o = 34^0$API and Υ_w = 1.05; μ = 3.676 cp. a) If $\mu_o < 70$cp, then $d_m = 242 W_c^{0.33} \mu_o^{0.25}$ b) If $\mu_o \geq 70$cp, then $d_m = 700 W_c^{0.33}$	**10**	**CO-I**
Q 6	Design the size of a horizontal separator for the following requirements: Gas - 15 MMSCFD at 0.65 specific gravity & Z=0.86; Oil - 1800 BPD at 34°API; Operating Pressure & Temperature - 800 psia & 80°F at which Viscosity = 0.014 cp; Retention time = 3 min for Droplet size of 140 micron removal; C_D = 0.933 Liquid fractions = α=β=0.5; Thickness of shell = 0.75 inch.	**10**	**CO-II**
Q 7	List various types of formation damage, their common causes, and the steps taken to reduce their effects. OR A 28 wt% HCl is needed to propagate wormholes 3 ft from a 0.328-ft radius wellbore in a limestone formation (specific gravity 2.71) with a porosity of 0.15. The designed injection rate is 0.1 bbl/min-ft, the diffusion coefficient is 10^{-9} m^2/sec, and the density of the 28% HCl is 1.14 g/cm^3. In linear core floods, 1.5-pore volume is needed for wormhole breakthrough at the end of the core. Calculate the acid volume requirement using i. Daccord's model and	**10**	**CO-III**

	ii. The volumetric model.		
Q 8	Demonstrate on open hole gravel packing operations	**10**	**CO-IV**
	SECTION-C		
Q 9	a. A sandstone with a porosity of 0.2 containing 10 v% calcite (CaCO3) is to be acidized with HF/HCl mixture solution. A pre-flush of 15 wt% HCl solution is to be injected ahead of the mixture to dissolve the carbonate minerals and establish a low pH environment. If the HCl pre-flush is to remove all carbonates in a region within 1 ft beyond a 0.328-ft radius wellbore before the HF/HCl stage enters the formation, what minimum pre-flush volume is required in terms of gallon per foot of pay zone? b. A well of 0.39 ft radius is drilled in a reservoir extending over 40 acres. The well and the reservoir properties are as follows: Average reservoir pressure: 2900 psi; Pay zone thickness: 16 ft; Oil viscosity: 2 cp; Formation volume factor of oil: 1.3 RB/STB; Formation permeability: 50 md; S: 5. i. Estimate the well's theoretical stabilized productivity assuming 25% drawdown ii. How much of an increase in productivity might be expected from an acid (S = -5) operation for 25% drawdown?	**20**	**CO-III**
Q 10	The following data are given for a hydraulic fracturing treatment design: Reservoir area: 160 acres; Pay zone thickness: 70 ft; Formation permeability: 1md; Young's modulus of rock: $3*10^6$ psi; Poison's ratio: 0.25; Fluid injection rate: 40 bpm; Fluid viscosity: 1.5 cp; Fluid efficiency = 39%; Leak-off coefficient: 0:002 ft/min$^{1/2}$; Proppant density: 165 lb/ft^3; Proppant porosity: 0.4; Final proppant concentration: 3 ppg; Fracture half-length: 1,000 ft; Fracture height: 100 ft; Fracture permeability = 200 darcy; Assuming KGD fracture, estimate the following design parameters: i. Fluid volume requirement ii. Fracture conductivity iii. Proppant weight requirement iv. Propped fracture width **OR** The following data are given for a hydraulic fracturing treatment design: Reservoir area: 160 acres; Pay zone thickness: 70 ft; Formation permeability: 1md; Young's modulus of rock: $3*10^6$ psi; Poison's ratio: 0.25; Fluid injection rate: 40 bpm; Fluid viscosity: 1.5 cp; Fluid efficiency = 39%; Leak-off coefficient: 0:002 ft/min$^{1/2}$; Proppant density: 165 lb/ft^3; Proppant porosity: 0.4; Final proppant concentration: 3 ppg; Fracture half-length: 1,000 ft; Fracture height: 100 ft; Fracture permeability = 200 darcy; Assuming PKN fracture, estimate the following design parameters: i. Fluid volume requirement ii. Fracture conductivity iii. Proppant weight requirement iv. Propped fracture width	**20**	**CO-IV**