UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, April 2018

Course: PTEG 425 Well Stimulation   **Semester: VIII**
Program: APE VIII(Upstream)
Time: 03 hrs.   **Max. Marks: 100**

Instructions: Read instruction of each section carefully and give precise answers.

	SECTION A		MARKS 20 4*5

All questions are compulsory

S. No.		Marks	CO
Q 1	What are Detrital minerals and Secondary minerals ?Give examples	5	CO 1,2
Q 2	In acidization process, what is the mechanism of acid transportation to mineral surface?	5	CO 3,4
Q 3	Primary purpose of hydraulic fracturing is to increase the effective wellbore area by creating a fracture of given geometry, whose conductivity is greater than the formation. What is fracture conductivity?	5	CO 5
Q 4	Discuss skin due to partial completion and slant. What necessitates such completions?	5	CO 1,2

	SECTION B		MARKS 40 4*10

Q. 5, 6, 7, are compulsory. Do any one out of 8 and 9

Q 5	Explain and derive material and energy balance in hydrofracturing.	10	CO 5,6
Q 6	Discuss the uncertainties associated with acidization of sand stone reservoirs. Give relevant equations.	10	CO 3,4
Q 7	What are different acid placement techniques in matrix acidization? Discuss different diversion methods by chemical diversion.	10	CO 4
Q 8	Treating formations with natural clay damage, production increase realized is dependent on the distance, which live HF can penetrate the formation. What are the factors, which have an effect on penetration of HF?	10	CO 2,3
Q 9	How sulfate ions and bi-carbonate ions in formation waters interfere in acidization? Sometimes precipitation occurs during cementation. Discuss conditions when such precipitations occur. Give relevant equations for each case.	10	CO 3,4

	SECTION-C		MARKS 40 2*20

Question number 10 is compulsory. Attempt any one out of Q11 and 12

Q 10	(a)How perforation skin effect is calculated? Explain with relevant equations. (b) Well of 3.936 inch radius is perforated at 2 spf with a phase angle of 180^0 penetration of 8 inches and perforation dia. is ½ inch. Calculate skin if k_H/k_V is 10.Values of constants, given.	a.10 b.10	CO 3,4

Constants for Perforation Skin Effect Calculation[a]

Perforation Phasing	a_θ	a_1	a_2	b_1	b_2	c_1	c_2
0° (360°)	0.250	-2.091	0.0453	5.1313	1.8672	1.6E--1	2.675
180°	0.500	-2.025	0.0943	3.0373	1.8115	2.6E−2	4.532
120°	0.648	-2.018	0.0634	1.6136	1.7770	6.6E−3	5.320
90°	0.726	-1.905	0.1038	1.5674	1.6935	1.9E−3	6.155
60°	0.813	-1.898	0.1023	1.3654	1.6490	3.0E−4	7.509
45°	0.860	-1.788	0.2398	1.1915	1.6392	4.6E−5	8.791

| Q 11	(a)Acid mineral reaction is a heterogeneous reaction. Discuss a typical acid mineral reaction kinetics. (b)**Following well data is given** Well A- Liquid production rate 60 bbls/day Well B- Liquid production rate 35 bbls/day Type of reservoir rock- Sand stone These wells were underperforming. Wells were acidized with half strength Mud acid and then put on production. Production performance is as follows Well A- Liquid production rate 100 bbls/day Well B- Liquid production rate 36 bbls/day Well performance of each well is as follows **Well A**	a.10. b. 10	CO 1,2,3,4
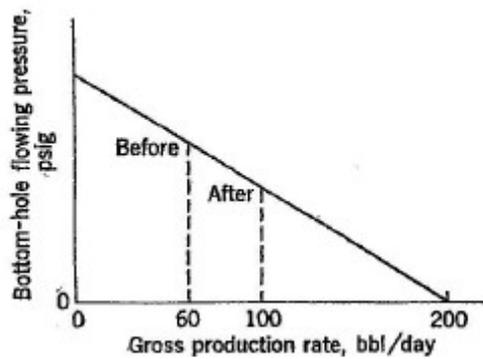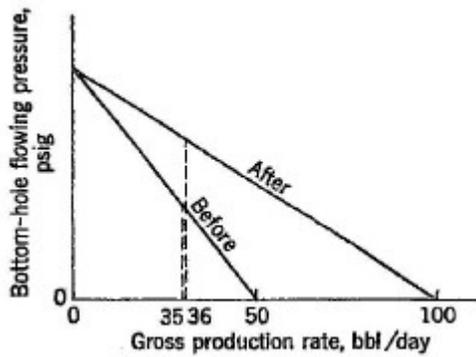
Well B

Not to scale.

Well A production increased by 40 bbls/ per day and Well B increased by 1 bbl. per day.

Which of these wells is a successful acid treatment? Justify your evaluation with detailed technical reasons.

Q 12	(a)What is the difference in PKN and KGD models for hydraulic fracturing? Explain with relevant equations. How to calculate maximum fracture width, average fracture width and fracture volume using PKN and KGD model. (b) Calculate maximum and average fracture width when fracture half length is 1000 ft. apparent viscosity of frac fluid 100 cp. Pumping rate is 40 bpm. **Assume** PKN model, Newtonian fluid v- 0.25, E -4x 10^6 .Calculate average width if x_f is 2000 ft.	a.10 b.10	CO 5.6