Name: Enrolment No:	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, May 2022

Programme Name: B.Tech. (APEG) **Semester :** VI
Course Name : Production Engineering II **Time :** 3 Hrs.
Course Code : PEAU4013P **Max. Marks :** 100
Nos. of page(s) : 2

Instructions:

1. All questions are compulsory
2. Attempt questions in order. All parts of the question must be attempted together
3. Assume any missing data, if any

S. No.	Section - A (5x4 = 20)	Marks	CO
Q1	Discuss the effect of the emulsifying agent on the stability of oil-water emulsion	**4**	**CO2**
Q2	Briefly explain different mechanism of formation damage	**4**	**CO3**
Q3	Illustrate fracture half-length with the help of a neat diagram	**4**	**CO4**
Q4	Define rangeability of a flow metering device with example	**4**	**CO5**
Q5	List the features of isothermal compression process	**4**	**CO5**
	Section - B (10x4 = 40)		
Q6	The natural gas specific gravity is 0.8. Estimate the following a) Molecular weight of natural gas b) Reduced pseudo-critical pressure at 1500 psia using Thomas et. al. method c) Reduced pseudo-critical temperature at 150^0F using Thomas et. al. method d) Density of 2 lb-mole of natural gas in lbm/ft^3 assuming compressibility factor as 0.95	**10**	**CO1**
Q7	Draw the schematic diagram of vertical heater treater mentioning all the sections with labelling.	**10**	**CO2**
Q8	Write short notes on the following a) Skin Factor b) Flow Efficiency Factor	**10**	**CO3**

Q9	Find a conical roof carbon steel tank to store 25,000 barrels of crude oil, using the API 650 standard, it is suggested to use "regular type" nozzle with nozzle size 14.	**10**	**CO5**
	Section - C (20x2 = 40)		
Q10	A 25-wt% HCl is needed to propagate wormholes 3 feet from a 0.328-feet radius wellbore in a dolomite 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 25 % HCl is 1.14 g/cm^3. In linear core floods, 2-pore volume is needed for wormhole breakthrough at the end of the core. Calculate the following a) Chemical reaction involved (Marks -1) b) Gravimetric dissolving power (Marks -2) c) Volumetric dissolving power (Marks -2) d) Acid capillary number (Marks - 5) e) Acid volume requirement in gal/ft. using Daccord's model (Marks -5) f) Acid volume requirement in gal/ft. using Volumetric model (Marks -5)	**20**	**CO3**
Q11	The following data are given for a hydraulic fracturing treatment design: • Pay zone thickness: 50 feet • Young's modulus of rock: 4 x 10^6 psi • Poison's ratio: 0.25 • Fluid viscosity: 1.25 cP. • Leakoff coefficient: 0.003ft/ $min^{1/2}$ • Proppant density: 185 lb/ft^3 • Proppant porosity: 0.4 • Fracture half length: 1,200 feet • Fracture height: 70 feet • Fluid injection rate: 35 bpm • Final proppant concentration: 5 ppg. Calculate the following: a) Fracture width using KGD model (Marks - 2) b) Time of injection of fracturing fluid assuming K_L = 1.5 (Marks - 5) c) Fracture, Injection, leakoff and pad volumes (Marks - 8) d) Time of pad volume (Marks - 2) e) Proppant concentration after 35 minutes of injection of fracturing fluid (Marks - 3)	**20**	**CO4**

Table 1 : Typical Sizes and Correspsonding Nominal Capacities for Tanks (API 650)

Tank Diameter, ft.	Capacity per ft. of Height, barrels	Tank Height (ft.) / Number of Courses in Completed Tank						
		16/2	24/3	32/4	40/5	48/6	56/7	64/8
10	14	225	335	450	-	-	-	-
15	31.5	505	755	1010	1260	-	-	-
20	56	900	1340	1790	2240	2690	-	-
25	87.4	1400	2100	2800	3500	4200	4900	5600
30	126	2020	3020	4030	5040	6040	7050	8060
35	171	2740	4110	5480	6850	8230	9600	10980
40	224	3580	5370	7160	8950	10740	12540	14340
45	283	4530	6800	9060	11340	13600	15880	18140
50	350	5600	8400	11200	14000	16800	19600	22400
60	504	8060	12100	16130	20160	24190	28220	26130
70	685	10960	16450	21950	27440	32930	-	-
80	895	14320	21500	28670	35840	35810	-	-
90	1133	18130	27220	36290	45360	-	-	-
100	1399	22380	33600	44800	-	-	-	-
120	2014	32250	48380	54200	-	-	-	-
140	2742	43900	64860	-	-	-	-	-
160	3581	57340	74600	-	-	-	-	-
180	4532	72570	-	-	-	-	-	-
200	5595	89600	-	-	-	-	-	-
220	6770	108410	-	-	-	-	-	-

Table 2 : Dimensions for Shell Nozzles in Inches. (API 650)

NPS (Size of Nozzle)	Outside Diameter of Pipe , OD	Minimum Distance From Bottom of Tank to Center of Nozzle	
		Regular Type	Low Type
60	60	64.625	60.375
54	54	58.625	54.375
52	52	56.625	52.375
50	50	54.625	50.375
48	48	52.625	48.375
46	46	50.625	46.375
44	44	48.625	44.375
42	42	46.625	42.375
40	40	44.625	40.375
38	38	42.625	38.375
36	36	40.625	36.375
34	34	38.625	34.375
32	32	36.625	32.375
28	28	34.625	30.375
26	26	32.625	28.375
24	24	30.625	26.375
22	22	29	24.375
20	20	27	22.375
18	18	25	20.375
16	16	23	18.375
14	14	21	16.375
12	12.75	19	14.375
10	10.75	17.75	13.2
8	8.625	15.75	11.2
6	6.625	13.75	9.2
4	4.5	12.125	7.875
3	3.5	10.25	6
2	2.375	9.5	5.25

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