

Name:

Enrolment No:



## UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, May 2021

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) : 4

### Instructions:

1. All questions are compulsory.
2. All the relevant data and chart are provided in the question paper.
3. Assume any missing data, if any

S. No.	Section - A (6x5 = 30) (Multiple Choice Question)	Marks	CO
Q1	Find the critical pressure ratio, if the gas-specific heat ratio is 1.3 a) 0.45 b) 0.55 c) 0.65 d) 0.75	5	CO1
Q2	Calculate the machinery factor of the sucker road pump, if the ratio of the length of crank arm to pitman arm is 0.33 a) 0.77 b) 1.00 c) 1.33 d) 1.66	5	CO2
Q3	The formation oil has a specific gravity of 24 <sup>0</sup> API and GLR of 400 scf/stb. In a gas lift installation, if the optimum GLR <sub>opt</sub> is 3000 scf/stb. Determine the gas injection rate (Mscf/day) to the well at an operating point with flowrate 500 stb/day a) 1100 b) 1200 c) 1300 d) 1400	5	CO3
Q4	Calculate the closing pressure of the valve, if the dome pressure is 1000 psia if the equivalent pressure caused by spring tension is negligible a) 950 b) 1000 c) 1050 d) 1110	5	CO3
Q5	If the pump pressure differential is 100 psi. Calculate the pumping head in feet of water column.	5	CO4

	a) 100 b) 131 c) 200 d) 231		
<b>Q6</b>	Find the lobe ratio of progressive cavity pump, if the number of rotor lobes are 2 a) 0.50 b) 0.67 c) 1.00 d) 1.50	<b>5</b>	<b>CO4</b>
<b>Section – B (5x10 = 50)</b>			
<b>Q1</b>	An oil well is producing from an under-saturated reservoir having a bubble-point pressure of 2130 psig and reservoir pressure of 3000 psig. The flow test indicate that the well produces 250 stb/day at a stabilized well-bore flowing pressure of 2500 psig. Construct the IPR data.	<b>10</b>	<b>CO1</b>
<b>Q2</b>	Determine the flowing bottom-hole pressure of a well. The data of the well is given below: <ul style="list-style-type: none"> <li>• Depth - 8000 feet</li> <li>• Tubing - 2 in.</li> <li>• Average reservoir pressure - 3000 psi</li> <li>• Wellhead pressure - 200 psi</li> <li>• G/O ratio - 200 scf/stb</li> <li>• Specific gravity - 0.65</li> <li>• Flow rate = 400 bpd (all oil)</li> </ul>	<b>10</b>	<b>CO1</b>
<b>Q3</b>	A well is producing at the rate of 350 bbl/d with a polish rod stroke length of 64 inch and a pumping speed of 20 SPM. The net lift of the pump is 4560 feet and the weight of the sucker rod string is 7433 lbf. Calculate the horse power rating of the prime mover, neglecting the tubing pressure. The specific gravity of the oil is 0.87 and the safety factor is 1.25	<b>10</b>	<b>CO2</b>
<b>Q4</b>	The maximum and minimum polished rod loads of a sucker road pumping unit are 15,000 lbs. and 3500 lbs. respectively. The well has a 2-in. plunger on 7/8-in. rods with a tubing anchor set at 5000 feet. Total weight of the counterweights is 6000 lbs. The sucker road pumping dimensions are: <ul style="list-style-type: none"> <li>• Length of the crank arm (c) is 28 in.</li> <li>• Distance between the center of gravity of counterweights and the crank shaft (r) is 40 in.</li> <li>• Distance from saddle bearing to tail bearing and bridle (<math>d_1</math> &amp; <math>d_2</math>) is equal</li> </ul> Calculate the following: a) Counterbalance load b) Structural unbalance	<b>10</b>	<b>CO2</b>

<b>Q5</b>	<p>Calculate the total dynamic head for a well that is producing water at the desired flow rate of 1300 bpd. The well data is given below:</p> <ul style="list-style-type: none"> <li>a) Perforation depth: 6000 feet</li> <li>b) Static Fluid Level: 1820 feet</li> <li>c) Productivity Index: 0.9 bpd/psi</li> <li>d) Wellhead Pressure required: 100 psi</li> <li>e) Tubing friction loss = 170 feet of water column</li> </ul>	<b>10</b>	<b>CO4</b>
<b>Section – C (1x20 = 20)</b>			
<b>Q1</b>	<p>An oil well has a pay zone around the mid-perforation depth of 5200 ft. The formation oil has a gravity of 35 API and GLR of 500 scf/stb. Water cut remains 0%. A 2-in tubing (ID: 1.955 in.) can be set with a packer at 200 ft. above the mid-perforation.</p> <p>In a continuous gas lift operation, If 1000 psia is available to kick off the well and then a steady casing surface injection pressure of 1000 psia is maintained for gas lift operation against a wellhead pressure of 120 psia. Assume a casing pressure margin of 0 psi, average reservoir pressure is 1900 psia and only 1 MMscfd of lift gas is available. Determine the following:</p> <ul style="list-style-type: none"> <li>a) Static gradient</li> <li>b) Whether the well flow naturally?</li> <li>c) Design tubing Gradient, if design tubing pressure at 5000 ft. is 600 Psia</li> <li>d) Design location of unloading valve</li> <li>e) Design location of operating valve</li> </ul>	<b>4x5 =20</b>	<b>CO3</b>

Table 1 : Pressure Transverse Curve (Hagedorn and Brown)

