Name: Enrolment No:	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2019

Programme Name: B. Tech (APE gas) **Semester : 7th**
Course Name : Production Engineering II **Time : 3 hrs.**
Course Code : PTEG 471 **Max. Marks : 100**
Nos. of page(s) : 2

Instructions:
1. Neat diagrams must be drawn wherever necessary.
2. Assume suitable data, if necessary.

SECTION A

S. No.		Marks	CO
Q 1	Build graph between head vs. Flow rate for reciprocating pump and centrifugal pump	4	CO5
Q 2	State any four type of compressors used in surface production facilities: -	4	CO5
Q 3	Explain the following terms with respect to oil and gas separation (a) Liquid carryover and b) Gas blowby	4	CO4
Q 4	Give operating pressure range values for of a) LP, b) MP and c) HP separators?	4	CO1
Q 5	Explain "Coriolis flowmeter" & "Positive displacement meter" used for measurement and metering of oil and gas	4	CO3

SECTION B

Q 6	Elaborate about "tank breathing process" and "gas blanket system" of a fixed roof storage tank?	4+4	CO4
Q 7	(a) Explain the mechanism of corrosion control of a storage tank (b) List applications of Horton sphere storage tank?	6+2	CO4
Q 8	(a) Calculate the free settling velocity of a 100 μm brine drop in oil. The oil has specific gravity of 0.8 and viscosity of 10 cP. Specific gravity of brine is 1.02. (b) Compute the pump factor in units of barrels per stroke for a duplex pump having 6.5" liners, 2.5" rods, 18" strokes, and a volumetric efficiency of 90%.	4+4	CO2
Q 9	Explain the factors on which stability of an emulsion depends upon: -	8	CO2

<table>
<tr><td>Q 10</td><td>Classify vane, wire mesh and microfibre impingement type of mist extractor on basis of parameters mentioned below
<table><tr><td>(a) Cost</td><td>(b) Efficiency</td><td>(c) Pressure drop</td></tr><tr><td>(d) Gas capacity</td><td>(e) Liquid capacity</td><td>(f) Solid handling</td></tr></table>
OR

Explain with diagram working of a horizontal heater treater</td><td>8</td><td>CO2</td></tr>
<tr><td colspan="4">SECTION-C</td></tr>
<tr><td>Q 11</td><td>(a) Explain the potential operating problems in a 2-phase oil and gas separator?

(b) Explain in detail vessel internals of a 2 phase oil and gas separator?</td><td>10 + 10</td><td>CO1</td></tr>
<tr><td>Q 12</td><td>(a) Following data is given for a 2-phase vertical separator.
Gas flow rate = 25 mmscfd Oil flow rate = 3000 bopd
Operating pressure = 800 psi Operating temperature = 80 ºF
Molecular weight of gas = 20.3 lb/mol ºAPI of oil = 40
Separator constant depending upon design and operating conditions = 0.3
flowing gas density = 3.4 lb/ft^3 flowing oil density = 51.5 lb/ft^3
Shell height is 10 ft. & separator is 30% filled with liquid.
Calculate (a) Diameter of vessel in inches (b) liquid capacity in bpd (10 marks)

(b) For a water-in-crude oil emulsion state the emulsifying agent? Elaborate about time required to grow a droplet size due to coalescence. State and explain the law (with equations) for estimation of settling/raising velocity of a droplet. (10 marks)

OR

(a) Calculate the diameter and seam-to-seam length of a vertical 2-phase separator using the information given below:
Gas flow rate = 10 mmscfd Oil flow rate = 2000 bpd
Specific gravity of gas = 0.6 , viscosity of gas = 0.013 cP
Gas compressibility factor = 0.84 ºAPI of oil = 40
operating pressure = 1000 psi operating temperature = 60 ºF
Retention time = 3 mins diameter of droplet size to be removed = 140 µm (15 marks)

(b) Calculate the pound per 1000 barrel of a salt present in crude oil having 10% by volume remnant water if its concentration is estimated to be 40,000 ppm at 25ºC. (5 marks)</td><td>20</td><td>CO1 or CO2</td></tr>
</table>
