ID NO.	

PRESIDENCY UNIVERSITY, BENGALURU

SCHOOL OF ENGINEERING

Weightage: 40 % Max Marks: 40 Max Time: 02 hrs. 07 May 2018, Monday

ENDTERM FINAL EXAMINATION MAY 2018

Even Semester 2017-18 Course: **PET 215 Natural Gas Engineering** VI Sem. Petroleum

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Instructions:

(i) Read the question properly and answer accordingly.
(ii) Scientific and Non-programmable calculators are permitted
(iii) Draw all figures with pencil only

Part A

(2 Q x 4 M = 08 Marks)

1. List out the conditions that tend to promote the formation of natural gas hydrates.
2. Consider a 6-in pipeline that is 15 miles long. Assuming that the compression and delivery pressures will remain unchanged, calculate gas capacity increases by taking the measure that, replace 7.5 miles of the 6-in pipeline by a 10-in pipeline segment.

Part B

(2 Q x 10 M = 20 Marks)

3. Draw a flow diagram of a typical solid desiccant dehydration plant (twin tower system) and label it properly.
4. Calculate the quantity rate of flow for the conditions given as follows:
   Base conditions: Gas field in Oklahoma, p_b=14.65 psia, t_b=60^{o}F
   Meter pipe: 4-in schedule 40 (4.026-in ID), flange taps, Static pressure measured upstream taps
   Orifice plate: Stainless steel, 1.5 inch measured at 20^{o}c
   Recorder: 100-in water column differential, 1000 psia static spring

Readings:

Elevation: 450 ft

Atmospheric pressure: 14.5 psia

Flowing temperature: $95^{o}F$

Gas-specific gravity: 0.65

Differential pressure: 75-in water column

Static pressure: 750 psig

Data Required: F_b= 471.14, b= 0.0336, Y= 0.9988, z= 0.85, g= 31.15

Part C

(1 Q x 12 M = 12 Marks)

5. For a reciprocating compressor, calculate the theoretical and break horsepower required to compress 50 MMcfd of a 0.7 specific gravity natural gas from 200 psia and $70^{o}F$ to 3200 psia. If the intercoolers cools the gas to $90^{o}F$, Estimate the gas temperatures at every stage? Assuming the overall efficiency is 0.75.

   Required Data: z_1= 0.9, z_2= 0.85

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Weightage: 20% Max Marks: 20 Max Time: 1 hr. 31 March Saturday 2018

TEST – 2 **SET B**

Even Semester 2017-18 Course: **PET 215 Natural Gas Engineering** VI Sem. Petroleum

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Instruction:

(i)Read the questions properly and answer accordingly.

(ii)Scientific and Non-programmable calculators are permitted

(iii)Plot the graph for question no. 3 only in graph sheet

Part A

(1Q x 4M = 04 Marks)

1. Define the following:
   (a) Sonic flow
   (b) Wet gas
   (c) TPR
   (d) Stage separation

Part B

(2Q x 4M = 08 Marks)

2. A 0.6 specific gravity natural gas flows from a 2-in pipe through a 1-in nozzle-type choke. The upstream pressure and temperature are 350psia and 55^{o}F, respectively. The downstream pressure is 120psia measured 2ft from the nozzle. The gas specific heat ratio is 1.1 and compressibility factor ratio is 1.
   (a) Is icing a potential problem?
   (b) What is the expected outlet pressure for subcritical flow?

3. Plot a graph for bottom hole node using following data and find the operating flow rate and operating pressure.

q_{sc} (Mscf/d)	IPR	TPR
0	2000	1020
191	1943	1021
383	1861	1023
574	1764	1026
765	1652	1031
1148	1374	1044
1530	987	1062
1721	703	1073
1865	353	1081
1913	0	1084

Part C

(1Q x 08 M = 08 Marks)

4. Explain briefly about horizontal single-tube separator with proper diagram and notations.

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PRESIDENCY UNIVERSITY, BENGALURU

SCHOOL OF ENGINEERING

Weightage: 20 % Max Marks: 20 Max Time: 1 hr. 24 Feb Saturday 2018

TEST – 1

Even Semester 2017-18 Course: **PET 215 Natural Gas Engineering** VI Sem. Petroleum

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Instruction:

(i) Read the question properly and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and Non-programmable calculators are permitted

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Part A

(1 Q x 4 M = 04 Marks)

1. Define the following:
   (a) Natural gas (b) Reservoir (c) Proved reserves (d) Dissolved gas

Part B

(1 Q x 6 M = 06 Marks)

2. Explain the well deliverability testing methods for estimating the productivity of gas wells with the help of figures.

Part C

(1 Q x 10 M = 10 Marks)

3. The analysis of sweet gas, in mole%, is known to be as follows: CH_4=92.5, C_2H_6=3.5, C_3H_8=2, N_2=1.25, $C0_2$=0.5, H_2S=0.25.Find the gas gravity. Also, find the Pseudo critical pressure & Pseudo critical temperature for the gas using (1) Kay's mixing rule (in form of table), (2) Wichert-Aziz correction method, (3) Ahmed correlation method

Component	Molecular Weight	Critical Pressure, psia	Critical Temparature, ^{0}R
CH_4	16.043	667.8	343.1
C_2H_6	30.070	707.8	549.8
C_3H_8	44.097	616.3	665.7
N_2	28.013	493.0	227.3
$C0_2$	44.010	1070.9	547.6
H_2S	34.076	1306.0	672.4