Reg. No. :

Question Paper Code:95905

B.E./B.Tech. DEGREE EXAMINATION, AUGUST 2021

Fifth Semester

Chemical Engineering

19UCH305- CHEMICAL PROCESS CALCULATIONS

(Regulation 2015)

Duration: 1:45 hour   Maximum: 50 Marks

PART A - (10 x 2 = 20 Marks)

(Answer any ten of the following questions)

1.	In double effect evaporator plant, the second effect is maintained under vacuum 475 torr (mm Hg) .Find the absolute pressure in kPa	CO1 A
2.	Find grams of HCl needed to prepare 1 litre 2N HCl solution	CO1 A
3.	Define Raoult's law and Dalton's law	CO1 R
4.	State law of conservation of mass.	CO2 R
5.	List the procedure for solving material balance problems.	CO2 R
6.	Write the formula for percent excess for equation A +B $\rightarrow$ C	CO2 A
7.	Define Molar humidity	CO3 R
8.	What is called Dry Bulb Temperature and Wet Bulb Temperature?	CO3 R
9	What is Dew point?	CO3 U
10	Define law of conservation of energy.	CO4 U
11	What is a flow and non-flow process?	CO4 R
12	Define specific heat	CO4 R
13	Define combustion reaction with an example	CO5 R
14	Define calorific value of a fuel.	CO5 R
15	Define Net Calorific value of a fuel	CO5 R

PART – B (3 x 10= 30 Marks)

(Answer any three of the following questions)

16. A natural gas has the following by volume : $CH_4 = 82\%$, $C_2H_6 = 12\%$ CO1- U (10)
    and $N_2 = 6\%$. Calculate the density of gas at 288 K (15^0C) and
    101.325 kPa and composition in weight percent

17. The dilute acid containing 25% H_2SO_4 is concentrated by commercial CO2- U (10)
    grade sulphuric acid containing 98% H_2SO_4 to obtain desired acid
    containing 65% H_2SO_4. Find the quantities of acids required to make
    1000kg of desired acid.

18. A mixture of acetone vapor and nitrogen contains 15.8% acetone by CO5- E (10)
    volume. Calculate the relative and percent saturation of the mixture at
    a temperature of 293K (20^oC) and a pressure of 101.325kPa.

    Data: Vapor pressure of acetone at 293K = 24.638 kPa.

19. Toluene is to be heated from 290 K (17^oC) to 350 K (77^oC) at the rate CO6- U (10)
    of 250 g/s. Evaluate the heat to be supplied to toluene using the heat
    capacity data given below.

    Data:

    $Cp^o = a + bT + cT^2 + dT^3$, KJ/kmol.K

Gas	a	b X 10^3	c X 10^6	d X 10^9
Toluene	1.8083	812.223	-1512.67	1630.01

20. Crude oil is analyzed to contain 87% carbon, 12.5% hydrogen and CO4- U (10)
    0.5% sulphur (by weight). Calculate the net calorific value of the crude
    oil at 298K (25^oC)

    Data:

    Gross Calorific value of crude oil at 2989K is 45071KJ/Kg oil.

    Latent heat of water vapor at 298K (25^oC) = 2442.5 KJ/Kg.

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