Question Paper Code: U3D02

B.E./B.Tech. DEGREE EXAMINATION, APRIL 2024

Third Semester

Biotechnology

21UBT302- STOICHIOMETRY AND FLUID MECHANICS

(Regulations 2019)

Duration: Three hours   Maximum: 100 Marks

Answer All Questions

PART A - (10x 2 = 20 Marks)

1.	What is Density and Specific Gravity	CO1- U
2.	Mention any two guidelines in writing SI units.	CO1- U
3.	Comment on Hess's Law.	CO3- Ana
4.	How will you calculate Percent Relative Saturation?	CO3- Ana
5.	Differentiate steady state and unsteady state operation	CO2- App
6.	Draw the block diagram of extraction column in material balance	CO2- App
7.	List the properties of fluids	CO1- U
8.	State Newton's Law of Viscosity.	CO1- U
9.	What are fluid moving machineries give examples	CO1- U
10.	Define minimum fluidization velocity	CO1- U

PART – B (5 x 16= 80Marks)

11. (a) The solubility of sodium chloride in water at 290 K is 35.8 kg/100   CO3- Ana   (16)
kg of water. Express the solubility as the following:
(a) Mass fraction and mass percent of NaCl
(b) Mole fraction and mole percent of NaCl
(c) kmolNaCl per 1000 kg of water

Or

(b) The absolute humidity of air is 0.015 kg water vapour/kg dry air. CO3- Ana (16)
Assuming the average molecular weight of air to be 29, calculate the following:
(a) The mole percent of water vapour in the air
(b) The molal absolute humidity, which is same as the mole ratio of water vapour to dryair

12. (a) The vapour pressure of acetone at 295 K is 13.25 kPa. For a mixture CO4- E (16)
of
nitrogen gas saturated with the vapours of acetone at 295 K and 105 kPa, calculate the following:
(a) The mole percent of acetone in the mixture
(b) The percent composition by weight
(c) The amount of vapour in kilograms per m^3 of the mixture.

Or

(b) Moist air contains 0.0109 kg water vapour per cubic meter of the CO4- E (16)
mixture at
300 K and 101.3 kPa. Calculate the following:
(a) The partial pressure of water vapour
(b) The relative saturation
(c) The absolute humidity of the air
(d) The percent saturation

13. (a) An aqueous solution of methanol containing 20% (weight) methanol CO2- App (16)
is to be separated into a distillate product containing 97% (weight)
methanol and a bottom product containing 2% (weight) methanol.
For treating 100 kg of feed with a reflux ratio of 3.5 on a weight
basis, calculate the following:
(a) The amounts of distillate and bottom products
(b) The amount of vapour condensed in the condenser per kg of
distillate
(c) The amount of vapour condensed in the condenser per kg of
feed.

Or

(b) A triple effect evaporator is used to concentrate 1000 kg ofaqueous CO2- App (16)
solution from a concentration of 20% solute to 80% solute.
Assuming an equal amountof vaporization in each effect, calculate
the composition and weight of the solution entering the second and
third effect evaporator.

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14. (a) Derive the necessary equation to demonstrate the hydrostatic law of fluid at static condition   CO2- App   (16)

<div align="center">Or</div>

   (b) Illustrate with neat diagram about the U-tube manometer with necessary equations.   CO2- App   (16)

15. (a) Describe the construction and working principle of packed bed reactors and give examples   CO3- Ana   (16)

<div align="center">Or</div>

   (b) Illustrate with neat diagram about the reciprocating pump for transporting fluids from a reservoir   CO3- Ana   (16)

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