Scheme of Valuation/Answer Key

(Scheme of evaluation (marks in brackets) and answers of problems/key)

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

THIRD SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018

Course Code: CH201

Course Name: CHEMICAL PROCESS CALCULATIONS

Max. Marks: 100 Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks.

			Marks
1	a)	Volumetric flow rate into m^3/s	(1)
		Density in kg/m^3	(1)
		Mass flow rate = volumetric flow rate x density (ans.)	(1)
	b)	Basis	(1)
		The concentration in weight percent,	(2)
		molarity of the solution	(2)
		molality of the solution	(2)
		Normality of the solution.	(1)
	c)	Unit operation – definition + example	(2)
		Unit process – definition + example	(2)
2	a)	Choosing correct basis, volume % = mole %	(1)
		composition by weight	(3)
		average molecular weight of the gas mixture	(2)
		density of gas mixture at 320 K and 1.5 bar	(2)
		Specific gravity of the gas mixture at 320 K and 1.5 bar	(1)
	b)	Basis	(1)
		Moles of carbon	(1)
		Moles of H2	(1)
		Moles of N2	(1)
		Correct molecular formula	(2)
3	a)	Definition of API gravity scale	(2)
		Specific gravity of gas oil	(1.5)
		Specific gravity of fuel oil	(1.5)
		Density of mixture after blending	(1)
	b)	*'h' in Btu/(ft^2.h.^{o}F) to W/(m^2.K)*	(2)
		Cp in *Btu/(lb.^{o}F) to kJ/(kg.K)*	(2)
		G in *lb/(ft^2.s) to kg/(m^2.s)*	(2)

		diameter is in *ft to m*	(1)
		substitution and final answer for 'a'	(2)

PART B

Answer any two full questions, each carries 15 marks.

4	a)	Humid heat – definition and equation	(1.5)
		Humid volume - definition and equation	(1.5)
	b)	$P = x.p_A^s + (1-x).\ p_B^s$	(2)
		$y = x.p_A^s/P$	(1)
		composition of liquid	(1)
		total pressure of the vapour	(1)
	c)	Antoine equation and vapour pressure of acetone	(1)
		molal humidity	(1)
		absolute humidity	(1)
		partial pressure of acetone	(2)
		relative saturation	(1)
		dew point	(1)
5	a)	Steam distillation – valid points	(2)
		applications	(1)
	b)	Percent saturation	(1)
		partial pressure of water vapour	(2)
		Percent relative saturation	(1)
		dew point of the system	(1)
		Wet bulb temperature.	(1)
	c)	Basis	(1)
		Overall balance	(1)
		Writing solid balance	(1)
		Oil in overflow and underflow	(2)
		% recovery (ans.)	(1)
6	a)	Basis and schematic representation	(2)
		Writing overall balance	(1)
		Weight fraction of Na_2CO_3 crystals and solute balance	(2)
		Solving the equation and final answer	(3)
	b)	schematic representation	(2)
		Writing total mass balance	(1)
		First evaporator balance	(1)
		Second evaporator balance	(1)
		Solving the equation and final answer	(2)

PART C

Answer any two full questions, each carries 20 marks.

7	a)	Proximate analysis of Coal – valid points	(3)
		Ultimate analysis of Coal – valid points	(3)
	b)	Basis	(1)
		Oxygen supplied and oxygen in dry flue gas	(2)
		Hydrogen burned and carbon present	(2)
		Obtaining Atomic ratio	(1)
	c)	Basis for the problem	(1)
		Calculation of oxygen supplied, required, nitrogen in the air etc	(3)
		combustion gas composition	(4)
8	a)	Derivation of energy balance equation – valid points and steps	(6)
	b)	Mean heat capacity	(4)

		No of moles	(1)
		Heat required	(3)
	c)	Basis	(1)
		$\Delta H=\Delta H1+\Delta H^0+\Delta H2$	(1)
		$\Delta H1$= heat of reactants	(1)
		$\Delta H2$=heat of products	(1)
		Find the value of ΔH , heat evolved or added in the reaction	(2)
9	a)	Theoretical flame temperature – valid points	(4)
	b)	Basis	(1)
		$\Delta H=\Delta H1+\Delta H^0+\Delta H2$	(1)
		Moles of product side and reactant side	(2)
		$\Delta H1$= heat of reactants	(2)
		$\Delta H2$=heat of products	(2)
		Find the value of ΔH , heat evolved or added in the reaction	(2)
	c)	Basis	(1)
		$\Delta H=\Delta H1+\Delta H^0+\Delta H2$	(1)
		Moles of product side and reactant side	(2)
		$\Delta H1$= heat of reactants	(2)
		$\Delta H2$=heat of products	(2)
		Find the value of ΔH , heat evolved or added in the reaction	(2)

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