Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER– IV(NEW) EXAMINATION – SUMMER 2015

Subject code: 2142810 **Date:01/06/2015**
Sub. Name: Process Calculations in Textile Wet Processing
Time: 10:30am-1.00pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	i) Give the three major relationships used for expressing weights and volumes 0f liquids, fibres and fabrics.	**04**
		ii) How much gallons of water must be used for treatment of 1500 lbs of fabric with bath ratio 20:1.	**03**
	(b)	i) Give the formulas showing correlations among the common methods for expressing the density of solutions.	**06**
		ii) How much is the weight of 1cc of water at 4^0C.	**01**
Q.2	**(a)**	Give Classification of physical quantities Write unit of following quantity with dimension: Area, Volume, Work, Power, Mass flow rate, heat capacity.	**07**
	(b)	Explain the material balance of extractor.	**07**
		OR	
	(b)	Elaborately explain batch and continuous processes in textile wet processing industry with suitable examples, merits and demerits.	**07**
Q.3	**(a)**	Define % Shade and M:L R. Calculate how much liter of a 2% stock dye solution and water must be taken to dye a 0.5% shade on 50 kg of fibrous material with M:L R = 1:20	**07**
	(b)	i) Explain the terms: Wet on Dry Pick up and Wet on Wet Pick up with the methods to determine them. Give the formulas for calculating dry on wet pick up and wet on wet pick up.	**07**
		OR	
Q.3	**(a)**	Explain three basic modes of heat transfer with suitable examples of processes and machineries from Textile wet processing Industry.	**06**
	(b)	i) A cotton fabric is to be treated with 5% OWF with a chemical finish in a wet on dry padding process. If the wet pick up is 90%, what concentration of chemical is needed? If the solution density is 1.05 gm/ml, what is required concentration in gm/liter?	**04**
		ii) If the fabric has linear density of 0.250 kg/m running through pad liquor with a speed of 80 m/min and wet pick up 90%, what is the flow rate of solution necessary to maintain a constant level in pad? (Solution density is 1.05gm/ml)	**04**
Q.4	**(a)**	It is required to make 1000kg mixed acid containing 60% H_2SO_4, 32% HNO_3, 8% water by blending (i) The spent	**07**

acid containing 13.3 % HNO_3, 44.4 % H_2SO_4 and 42.3 % H_2O. (ii) Aqueous 90% HNO_3 (iii) aqueous 98% H_2SO_4. All % are by mass. Calculate the quantities of each of the three acids required for blending

(b) Classify the material balance. Discuss the methods of solving material balance problems without chemical reaction. **07**

OR

Q.4 **(a)** What are distillation, gas absorption and crystallization? 10000 kg of an aqueous solution containing 29.6 % (by weight) anhydrous sodium sulphate at 377K (104^0C) is charged to the crystallizer. During the cooling operation 5 % of the initial water is lost by evaporation and as a result $Na_2So_4.10H_2O$ is crystallized out. The mother liquor is found to contain 18.3 % (by weight) anhydrous sodium sulphate. Calculate the yield of crystals and the quantity of mother liquor. **07**

Q.4 **(b)** Discuss construction and working of a venturi meter and derive equation for volumetric flow rate for the same. **08**

Q.5 **(a)** Write short notes on(i) Reynolds's experiment (ii) Pitot tube **06**

(b) Derive Hagen-Poiseuille equation clearly mentioning the assumptions **07**

OR

Q.5 **(a)** Differentiate between Newtonian and non-Newtonian fluids with diagrams and examples. **06**

(b) Discuss the terms: Specific heat capacity, Specific latent heat, Thermal conductivity and Thermal diffusivity. **08**

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