



**K. K. Wagh Institute of Engineering Education & Research, Nashik**  
(An Autonomous Institute From A.Y. 2022-23)

	InSem Examination-IWinter 2023		
	Exam Seat No.:		
	Academic Year:2023-2024	Semester: III	
	Name of Programme: B.Tech	Pattern:2023	
	Name of Course: Process Calculations	Course Code:CHE222005	
	Max. Marks:30	Duration: 1 hour	

	<p><b>Instructions:</b> Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.</p> <ol style="list-style-type: none"><li>1. This question paper contains 2 page(s).</li><li>2. Answer to each new question is to be started on a new page.</li><li>3. Assume suitable data wherever required, but justify it.</li><li>4. Draw the neat labelled diagrams, wherever necessary.</li><li>5. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question</li></ol>	
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**Question No. 1 Attempt following Question**

a)

(i) The strength of aqueous solution of soda ash is specified as 15%  $\text{Na}_2\text{O}$  by weight. Express the composition in terms of weight per cent soda ash. **(4 marks)**

(8) CO1,  
CO2

(ii) 10 g of caustic soda are dissolved in water to prepare 500 ml of solution. Calculate the Normality? **(4 marks)**

**OR**

b)

(i) An aqueous solution of sodium chloride is prepared by dissolving 20 kg of  $\text{NaCl}$  in 100 kg of water. Calculate weight% composition of solution. **(4 marks)**

(8) CO1,  
CO2

(ii) 10 kg of  $O_2$  contained in a closed container of volume  $2\text{ m}^3$  is heated without exceeding a pressure of 709.28 kPa. Calculate the maximum temperature of gas attained. **(4 marks)**

- c) Write the definition of Ideal gas Law, Dalton's Law, Amagat's Law? (7) CO1  
Describe the Raoult's Law and it's applications.

**OR**

- d) Spent acid from a fertilizer plant has the following composition by weight.  $H_2SO_4 = 20\%$ ,  $NH_4HSO_4 = 45\%$ ,  $H_2O = 30\%$  and Organic compound = 05%. Calculate the total acid content of the spent acid in terms of  $H_2SO_4$  after adding the acid content chemically bound in ammonium hydrogen sulphate. (7) CO1

**Question No. 2 Attempt following Question**

- a) Soyabean seeds are extracted with hexane in batch extractor. The flaked seeds are found to contain 18.6 % oil, 69% solid and 12.4% moisture (b weight). At the end of the extraction process, cake (meal) is separated from hexane-oil mixture. The cake is analyzed to contain 0.8% oil, 87.7% solids and 11.5%, moisture (by weight). Find the percentage recovery of oil. (8) CO2, CO3

**OR**

- b) (i) Explain Bypass operation with neat diagram **(4 marks)**  
(ii) Explain Material Balance for Distillation with neat diagram? **(4 marks)** (8) CO2, CO3

- c) The dilute acid containing 25 %  $H_2SO_4$  is concentrated by commercial grade sulphuric acid containing 98 %  $H_2SO_4$  to obtain desire acid containing 65 %  $H_2SO_4$ . Find the quantities of acids required to make 1000kg of desired acid. (7) CO2, CO3

**OR**

- d) 2000 kg of wet solids containing 70 % solids by weight are fed to tray dryer where it is dried by hot air. The product finally obtained is found to contain 1 % moisture by weight, Calculate (a) Kg of water removed from wet solids (b) kg of product obtained. (7) CO2, CO3