MODEL QUESTION PAPER					
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)					
B.E. in Biotechnology					
Course Name: UNIT OPERATIONS + LAB			**Course code: BBT302**		
Third Semester BE Degree Examination Jan/Feb 2024					
Time : 3 hours			Max marks: 100		
Note : Answer any FIVE full questions, choosing ONE full questions from each module					
Module-1					
1	a.	State pascal's law and prove the pressure at all directions are equal.	CO1	L1	10
	b.	Discuss Bunkingham's л theorem and estimate an equation by bunkingham method for given variables f(dp , d, l, ,u, g,μ)=0	CO1	L2	10
Or					
2	a.	Describe different types of fluids with help of plot shear stress and strain.	CO1	L1	10
	b.	Water is flowing through a tapper pipe of length 100m having diameter 600mm and diameter at lower end 300mm. Flowrate is given as 50lt/sec the pipe has slope of 1/30. Find the pressure at lower end, pressure at upper end P_2 is 19.62 N/cm^2	CO1	L2	10
Module-2					
3	a.	State the construction, principle and working of centrifugal pumps.	CO2	L1	10
	b.	A venturi meter is installed in a pipeline for measurement of flow rate of water. The pressure drop across the throat and up streams of the meter is 10cm of mercury. Calculate the volumetric flow rate of water in m^3/s.	CO2	L2	10
Or					
4	a.	Define crushing laws and name different types of crushers.	CO3	L1	10
	b.	Explain working principle of filtration and write types of filtrations	CO3	L2	10
Module-3					
5	a.	Estimate an expression for heat conduction through multilayer walls.	CO4	L2	10
	b.	Demonstrate about log mean temperature difference and fouling factor for a heat exchanger.	CO4	L3	10
Or					
6	a.	Explain convection types and principle of heat transfer coefficient.	CO4	L2	10
	b.	With neat sketch explain in detail about double pipe heat exchanger.	CO4	L3	10
Module-4					
7	a.	Illustrate an expression for steady state equimolar counter diffusion in gases.	CO5	L3	10
	b.	Differentiate in detail about mass transfer coefficient and overall mass transfer coefficient.	CO5	L4	10
Or					
8	a.	Write types of diffusion and the expression for Fick's law	CO5	L3	10
	b.	Calculate the flux of diffusion for oxygen for cases, given in an oxygen-nitrogen gas mixture at 101.3 kPa and 298 K, the	CO5	L4	10

		concentrations of oxygen at two phases 2mm apart are 10 and 20 % by volume respectively. cases where- i) the nitrogen is non diffusing ii) There is equimolar counter diffusion of the two gases. Diffusivity of oxygen in nitrogen is $1.81 * 10^{-5}$ m^2/s.			
Module-5					
9	a.	Demonstrate the types of distillation and with neat sketch explain simple distillation	CO5	L3	10
	b.	Illustrate factors for selection of solvent used in extraction process.	CO5	L4	10
Or					
10	a.	With neat diagram explain mass transfer in tray dryer.	CO5	L4	10
	b.	Demonstrate the following terms i) Moisture content wet basis ii) Moisture content dry basis iii) Falling rate period iv) Free moisture content v) Relative humidity	CO5	L3	10