

B.E. CHEMICAL ENGINEERING THIRD YEAR FIRST SEMESTER EXAM 2025**FERMENTATION TECHNOLOGY: PRINCIPLE AND APPLICATION****Part – I**

Time: 3hrs

Full Marks: 100

Group-A

Answer any one question

1×10 = 10

1. What are the parameters, which control the fermentation process? Write their effects.
2. What are the resistances operate in oxygen transfer from bulk air phase to liquid media?

Group-B

Answer any two questions

2×20 = 40

3. Define $k_L a$, OTR and OUR. Mention the parameters which affect the $k_L a$ value and write their role. Prove that specific growth rate and dilution rate are same in CSTR under steady state condition. 6+8+6 = 20
4. (i) Write short note on $k_L a$ measurement method by dynamic method.
(ii) The air supply to a fermenter was turned off for a short period of time and then started. A value for C^* of 7.3 mg/l has been determined for the operating conditions. Use the tabulated measurements of dissolved oxygen (DO) values to estimate the oxygen uptake rate and $k_L a$ in this system.

Air off							Air on										
Time (min)	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DO (mg/l)	3.3	2.4	1.3	0.3	0.1	0	0	0.3	1.0	.16	2.0	2.4	2.7	2.9	3.0	3.1	3.2

8+12 = 20

5. (i) Briefly describe the different scale-up criteria's of fermenter.
(ii) Consider the scale-up of a fermentation from a 10L to 10000L vessel. The small fermenter has a height to diameter ratio of 3. The impeller diameter is 30% of the tank diameter. Agitator speed is 500 rpm and three Ruston impellers are used. Determine the dimensions of the large fermenter and agitator speed for: (a) constant P/V ; (b) constant impeller tip speed; (iii) Constant Reynolds number. 8 + 12 = 20

[Turn over

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Part II(Marks 50)

Answer Q 1 and any three (Q2 to Q7) from the following: 4x5+3x10

1. Differentiate between: 4x5
 - a)primary metabolite and secondary metabolite
 - b)turbidostat and chemostat method
 - c)homofermentative and heterofermentative LAB
 - d)bacteriostatic and bactericidal antibiotic
2. Define bioethanol. Mention the steps involved for production of bioethanol from starch feed stock. How absolute ethanol is obtained from fermented broth. 1.5+4+4.5
3. Explain grape vinegar and spirit vinegar. State and explain about conversion of alcohol into vinegar by acetic acid bacteria. 5+5
4. What is antibiotic? Give an example of antibacterial antibiotic. Write the spectrum of activity of Penicillin? Give the flow chart of recovery of PenG after completion of fermentation. 2+1+2+5.
5. What are the advantages of using grapes for wine fermentation? Explain the effect of clarification of fruit juice on wine fermentation. What is anaerobic fermentation? 2+3.5+4.5
6. What is semisynthetic Penicillin? Give two examples. Explain German process of vinegar production. 2.5+2+5.5
7. Write short notes on any two from the following: 2x5
 - a)steps of recovery of lactic acid from fermented broth.
 - b) solid state fermentation
 - c) flow chart for yoghurt preparation