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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

February / March 2023 Semester End Main Examinations

Programme: B.E. **Semester: VII**
Branch: Biotechnology **Duration: 3 hrs.**
Course Code: 19BT7DCEQD **Max Marks: 100**
Course: Bioprocess Equipment Design and CAED **Date: 28.02.2023**

Instructions: 1. Answer questions from all units.
2. Missing data, if any, may be suitably assumed.

UNIT - I

1 a) Sketch the symbols for **10**
   (i) Rotary pump
   (ii) Evaporator
   (iii) Spray column
   (iv) Ball mill
   (v) Spray drier

b) Discuss about the factors satisfying the performance and reliability of the process equipment. **10**

UNIT - II

2 a) Draw a neat proportional sketch of diaphragm valve and list its parts. **10**

b) Draw a schematic diagram of a bioreactor and label its parts. **10**

OR

3 a) Draw different types of welding joints. **08**

b) Draw a neat proportional sketch of gate valve and list its parts. **12**

UNIT - III

4 A continuous packed bed distillation column is to be designed for separating 5,000 kg/h of a liquid mixture containing 30 mole % of methanol and 70 mole % of water into overhead product containing 95 mole % of methanol. The residue contains 5 mole % of methanol. A reflux ratio of 3.0 is used. Design the packed bed distillation column. **60**

Data:

T(°C)	100	93.5	89.3	84.4	78	73.1	69.3	66	64.5
x_A	0	0.04	0.08	0.15	0.3	0.5	0.7	0.9	1
y_A	0	0.23	0.365	0.517	0.665	0.779	0.87	0.958	1

Draw a neat sectional front view of the packed bed distillation column and label its parts.

OR

5 Design a fermenter with diameter 1.525 m and volume of 6.056 m^3. A flat six blade disc turbines are provided for agitaion of diameter 0.71 m with four baffles. First blade is present at at height of 0.61 m and second one is at height of 1.83 m from bottom of the vessel or tank. Agitator speed is 92 rpm. Air is introduced below the lower impeller at a superficial velocity of 0.01067 m/s based on tank cross sectional area. **60**

Data:

- Specific gravity of fluid= 1.038 kg/m^3
- Viscosity of fluid =1.4 cP
- Jacket spacing =100 mm
- Internal pressure= 2.5 kg_f/cm^2
- Steam pressure= 1.5 kg_f/cm^2
- Material of construction is stainless steel
- Allowable Stress= 55×10^6 N/m^2
- Yield Stress= 1950 kg_f/cm^2
- Standard motor efficiency = 70%

Draw a neat sectional front view of the fermenter and label its parts.

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