U.S.N.										

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

Autonomous Institute Affiliated to VTU

September / October 2023 Semester End Main Examinations

Programme: B.E. **Semester: III**
Branch: Biotechnology **Duration: 3 hrs.**
Course Code: 22BT3PCFME **Max Marks: 100**
Course: Fluid Mechanics

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

UNIT - I

1 a) The power required by an agitator in a tank is a function of the following variables: a. Diameter of the agitator b. Number of rotations of the impeller per unit time c. Viscosity of liquid d. Density of liquid from dimensional analysis using Buckingham's method, obtain a relation between power and the four variables. **10**

b) Differentiate between laminar and turbulent flow by describing the Reynolds's experiment with suitable diagram. **10**

UNIT - II

2 a) Derive Ergun equation for pressure drop for flow through porous media. **10**

b) Water flows at a rate of 50 L/s through a taper pipe at 80 m length. The pipe has a slope 1 in 30. Estimate the pressure at the lower end, if the pressure at higher level is 2 bar. **10**

OR

3 a) Prove that the average velocity is one half the maximum velocity for an incompressible fluid flowing in a pipe. **10**

b) Fermentation broth of density 840 kg/m^3 is pumped at a rate of 3 L/s through 600m steel pipe under a pressure drop of 550 kPa. Calculate the fanning friction factor if the pipe diameter is 52mm. **10**

UNIT - III

4 a) Illustrate the construction and working principle of Venturimeter. What are its advantages compared to Orificemeter? **10**

b) A rotameter tube is 0.3m long with an internal diameter of 25mm at the top and 20mm at the bottom. The diameter of float is 20 mm. Determine the position of the float when metering water at the rate 100 cm^3/s. Specific gravity of float = 4.8, volume of float = 6 cm^3, coefficient of discharge of meter = 0.72 and density of water = 1000 kg/m^3 **10**

UNIT - IV

5 a) Describe the construction and working principle of centrifugal pump with neat labelled diagram. **10**

b) A single reciprocating pump has a stroke of 300mm length and a piston diameter of 150mm. It delivers water through height of 25m. The pump works at 60 rpm. What would be the theoretical discharge and theoretical power required by the pump if the actual discharge is 4.8 L/s. Estimate the percentage slip. **10**

OR

6 a) Derive the equation for constant pressure filtration. **10**

b) With a suitable diagram, explain the construction and working principle of Centrifugal filter. **10**

UNIT – V

7 a) Elaborate on the construction and working principle of ribbon blenders with a neat labelled sketch. **10**

b) Differentiate axial flow pattern from radial flow patterns of mixing. Discuss the features of turbines with suitable diagram. **10**

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