Reg. No.

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

III SEMESTER B.TECH. (CHEMICAL ENGINEERING)

END SEMESTER EXAMINATIONS, NOVEMBER 2017

SUBJECT: MOMENTUM TRANSFER [CHE 2102]

REVISED CREDIT SYSTEM

DATE: 16/11/2017, TIME: 9-12PM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer ALL the questions.
- Missing data may be suitable assumed.

1A.	The pressure difference in a pipe line through which water is flowing is measured by an U tube mercury manometer. The manometer indicates 20cm of mercury. What would be the corresponding reading, if the manometer is replaced by CCl_4 of specific gravity 1.5? Derive the equation used here.	04
1B.	Explain the rheological classification of fluids.	04
1C.	Define: i) Equivalent length ii) Entrance length	02
2A.	What diameter pipe will deliver oil at a Reynolds number of 2000 and at 170 liters per minute? The kinematic viscosity of oil is 2.3 centistokes.	02
2B.	Derive Bernoulli's equation. State all the assumptions.	04
2C.	A venturimeter with throat diameter of 15mm is installed in a pipeline of 25mm diameter. An U tube mercury manometer measures the pressure differences of 10 cm of mercury. Calculate the volumetric flow rate of water flowing through the meter assuming the coefficient of the meter as 0.98. Derive the equation used here.	04
3A.	Derive Prandtl's log velocity distribution equation for the turbulent flow through a circular pipe. State all the assumptions	04
3B.	Sulfuric acid of specific gravity 1.53 and viscosity 1.2 CP is to be pumped at a rate of 4 liters per second through a pipe of 25 cm diameter to a height of 25 meters. The pipe has two rectangle bends. Each bend may be assumed to contribute to the head loss by 1.5 times the velocity head. Head loss due to friction may be assumed be 45 times the velocity head. Calculate the horse power of the pump required.	04
3C.	Explain the characteristics of turbulence.	02
4A.	Derive Ergun's equation for the flow through packed beds. State all the assumptions.	05
4B.	Define the terms the drag and drag coefficient	02

4C.	Define Mach Number. Hydrogen gas flows at a velocity of 50m/s under a pressure of 1.3 bar absolute. If the temperature of the gas is 25^0C, at what Mach number does the flow takes place? Indicate the range. Assume n=1for hydrogen gas.	03
5A.	The pressure drop in a viscous incompressible fluid flowing through a pipe in a length 'L' may be represented functionally as $\Delta P = f(\mu, \rho, v, D, L, k)$ where μ= viscosity, ρ= density, v= velocity, D=diameter L= length and k= roughness. Using Buckingham π method of dimensional analysis, find the correct representation for the pressure drop in terms of dimensionless groups.	05
5B.	Differentiate between centrifugal and reciprocating pump	05

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