Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

III SEMESTER B.TECH. CHEMICAL ENGINEERING)

END SEMESTER EXAMINATIONS, NOV/DEC 2016

SUBJECT: MOMENTUM TRANSFER [CHE 2102]

REVISED CREDIT SYSTEM

(23/11/2016)

Time: 3 Hours MAX. MARKS: 100

Instructions to Candidates:

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

1A.	If the pressure and temperature at sea level are 760 mm of mercury and 15^{o}C respectively, calculate the pressure at an altitude of 4.87 KM assuming an adiabatic atmosphere. Derive the equation used here.	**08**
1B.	Explain the rheological classification of fluids.	**04**
1C.	Derive equations for shear stress and velocity distribution in a steady, laminar, incompressible fluid through a circular pipe. Prove that the average velocity is equal to half the maximum velocity.	**08**
2A.	Define Newton's law of viscosity. Find the kinematic viscosity of oil of density 981kg/m3. The shear stress at a point in oil is 0.2452 N/m^2 and velocity gradient at that point is 0.2 per second.	**06**
2B.	Derive Darcy's Equation. State all the assumptions	**06**
2C.	Water is to be pumped from ground level tank to a cooling tower. The difference between the level of water in the tank and discharge point is 15 meters. The velocity of water through 40mm internal diameter discharge pipe is 3m/s. The length of the entire pipe is 30 m. Calculate the power required to pump if the efficiency of the pump is 60%. Use appropriate equation for calculating friction factor.	**08**
3A.	Oil of viscosity 0.048 kg/ms flows through 18 mm diameter pipe with the velocity of 0.4 m/s. the density of the oil is 800 kg/m^3. Calculate the pressure drop in the length of 45 meters pipe line.	**07**
3B.	Explain the physical significance of Reynolds number.	**06**
3C.	Explain the characteristics of turbulence.	**07**
4A.	Obtain equations to correlate packed bed pressure drop for laminar and turbulent flow conditions. Indicate all the assumptions in deriving the equations.	**10**
4B.	Differentiate between variable head and variable area meters.	**04**

4C.	Oil of specific gravity 0.88 and viscosity 50cp flows in a pipe of 7.5 cm diameter. The flow is measured by a pitot tube located centrally. U tube inclined manometer containing water as measuring fluid shows the reading of 40 cms. Angle of inclination of an inclined limb to the horizontal is 15^{o}. Find the discharge in liters per minute.	**06**
5A.	A gaseous fuel of molecular weight 29 is at steady flow through a nozzle of 2.5 cm diameter to a furnace where the pressure is 1 atm. The temperature and pressure at the entrance to the nozzle are 17^{0}C and 2.632 atm. If the expansion factor is 1.4 and the coefficient of the nozzle is 0.95, estimate the mass flow rate through the nozzle. Derive the equation used here.	**10**
5B.	Explain i) Cavitation ii) NPSH	**06**
5C.	Write a brief not on Buckingham π theorem.	**04**