Reg. No.										

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

III SEMESTER B.TECH (CHEMICAL ENGINEERING)

END SEMESTER EXAMINATIONS, NOV/DEC 2015

SUBJECT: MOMENTUM TRANSFER [CHE- 203]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 100

Instructions to Candidates:

- Answer **ANY FIVE FULL** the questions.
- Missing data may be suitable assumed.

1A.	A closed vessel contains a liquid of density 1000 kg/m^3 and a piezometer tube communicates with the vessel at depth of 1.5 m under the free surface. Presuming that the absolute pressure on the free liquid surface is 2.5X10^5 N/m^2 and the atmospheric pressure is 1.013X10^5 N/m^2, make calculations for the height to which liquid will rise in the piezometer.	**06**
1B.	Explain the basic hydrodynamic behavior of fluidized beds.	**06**
1C.	A venturimeter is to be installed in 10cm diameter pipe line to measure the flow of water. Maximum flow rate is expected to be 11m^3/min. The manometer is filled with mercury and reads 100 cms. What throat diameter is specified if the co efficient of venturimeter is 0.95? Derive the equation used here.	**08**
2A.	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.	**10**
2B.	Derive the Bernoulli's Equation for a steady incompressible flow through a stream tube. State all the assumptions.	**10**
3A.	Derive Darcy's equation and using this equation, for laminar flow through a circular pipe prove that f = 16/N_{Re}.	**08**
3B.	Differentiate between centrifugal and reciprocating pump.	**06**
3C.	Explain the characteristics of turbulence.	**06**
4A.	Obtain equations to correlate packed bed pressure drop for laminar and turbulent flow conditions. Indicate all the assumptions in deriving the equations	**12**
4B.	Water at 15^{o}C is pumped from a large reservoir to the bottom of an open tank 10m above the reservoir surface through 12cm I.D. pipe at a rate of 12 liters per second. The total energy loss due to friction in the piping system is 125 J/Kg. Calculate the HP required for the pump which has the overall efficiency of 60%.	**08**

5A.	The pressure drop in a viscous incompressible fluid flowing through a pipe in a length 'L' and diameter 'D' may be represented functionally as $\Delta P = f(\mu, \rho, V, D, L, k)$ where μ= viscosity, ρ= density, V= velocity, and k= roughness. Using Buckingham π method of dimensional analysis, find the correct representation for the pressure drop in terms of dimensionless groups.	**10**
5B.	Derive prandtl's log velocity distribution equation for turbulent flow through a circular pipe. Indicate all the assumptions.	**10**
6A.	Define Mach number and explain its physical significance. Ammonia flows at a velocity of 22.275m/s under a pressure of 2 atmospheres absolute. If the temperature is 17^oC, at what Mach number does the flow takes place? Indicate the range.	**06**
6B.	Explain the terms i) Cavitation and ii) NPSH	**06**
6C.	Electrical transmission towers are stationed at 1 km intervals and a conducting cable 2 cm in diameter is placed between them. If the wind velocity is 50 km/hr blowing transversely across the wires, calculate the total force to which each tower carrying 25 such cables. Assume the drag coefficient to be 1.2 and the density of air to be 1.2 kg/m^3.	**08**