Reg.No.										

MANIPAL INSTITUTE OF TECHNOLOGY
(A Constituent Institute of MAHE –Deemed University)

III SEM. B.E. (MECHANICAL ENGG.) DEGREE END SEMESTER (MAKE-UP) EXAMINATION JAN. 2007

SUBJECT : FLUID MECHANICS (MEE -203)
REVISED CREDIT SYSTEM
(09/01/2007)

Time: 3 Hours. MAX.MARKS: 50

Instructions to Candidates:
- Answer **ANY FIVE FULL** questions.
- All questions carry equal marks.
- Missing data, may be suitably assumed if necessary.
- Draw neat sketches wherever necessary.

1A) Distinguish between (minimum two distinguishing features):
i) Weight density and mass density.
ii) Absolute viscosity and kinematic viscosity. (02)

1B) Convert a pressure of 5 bar to:
i) Metres of mercury ii) Metres of oil (oil sp.gr=0.75) iii) Metres of water. (03)

1C) A uniform body of size 3m long and 2m wide and 1m deep floats in water. What is the weight of the body if the depth of immersion is 0.8m? Determine the metacentric height and state if the body is in stable equilibrium or not. (05)

2A) Derive the expressions for hydrostatic force on an inclined plane surface and the depth of centre of pressure. (04)

2B) Sketch and derive the manometric equation for a simple U tube manometer used for measuring vacuum pressure, mercury is the manometric liquid. (02)

2C) Water flows at the rate of 0.147 m^3/s through a 150mm diameter orifice inserted in a 300 mm diameter horizontal pipe. If the pressure gauges fitted upstream and at the vena-contracta of the orifice meter have shown 176.58 kN/m^2 and 88.29 kN/m^2 respectively find the coefficient of discharge of the orifice meter. (04)

3A) Derive the Euler's equation of motion along the streamline and reduce it to Bernoulli's equation. State the assumptions made. (04)

3B) A shaft of 100mm diameter rotates at 60rpm in a 200 mm long bearing. Taking that the two surfaces are uniformly separated by a distance of 0.5 mm and taking linear velocity distribution in the lubrication oil having dynamic viscosity of 0.004 Ns/m^2, find the power absorbed in the bearing. (04)

3C) A 2.5m ship model was tested in fresh water (ρ= 1000 kg/m^3) moving at 2 m/s. Workout the velocity of the 40m prototype ship. (02)

4A) Show that for maximum transmission of power by means of water, the frictional loss of head in the pipe equals one third of the total head supplied. (04)

4B) Air flows with a velocity of 360 m/s through a duct. At a particular section of the duct, the pressure and temperature are 85 KPa and 290K. Assuming the flow to be isentropic estimate i) Mach number at the given section and ii) estimate temperature and velocity at another section where the pressure is 125 KPa and Mach number is 0.687. (04)

4C) Define i) Non-uniform flow ii) Steady flow.
iii) Irrotational flow. iv) Laminar flow. (02)

5A) Show that for a laminar viscous flow through a circular pipe. V average = ½ V maximum. (05)

5B) The resistance R due to wind on a tall chimney is dependent upon the density "ρ", viscosity "μ" of air, the wind velocity "V", the diameter "D" and height "H" of the chimney, by means of Pi-theorem develop the expression of the resistance of the chimney. (05)

6A) Write short notes on:
i) Boundary layer on a flat plate.
ii) Pressure drag
iii) Stability criteria for floating body. (06)

6B) An old water supply distribution pipe 25cm diameter of a city is to be replaced by two parallel pipes of smaller and equal diameter, having equal lengths and identical coefficient of friction values. Find out the new diameter required. (04)