INDIAN MARITIME UNIVERSITY
(A Central University, Govt.of India)

May/June 2015 End Semester Examinations

SEMESTER – IV, B.TECH (MARINE ENGINEERING)

FLUID MECHANICS- I (T 2405 / T 1405)

Date:19.06.2015 **Max.Marks:100**
Time:-3 Hrs **Pass Marks:50**

PART – A **(3 x10 = 30 Marks)**
(Compulsory Questions)

1. a) Define. Surface tension and how is it related to capillary rise ?

   b) Write the units of dynamic and kinematic viscosities?

   c) Explain geometric and dynamic similarities .

   d) What are dynamic and kinematic similarities ?

   e) Explain total force and centre of pressure of an immersed surface. .

   f) Define the term (i) Hydraulic gradient line and (ii) Total energy line.

   g) Compare between forced vortex and free vortex flow..

   h) State Darcy's formula and Chezy's formula..

   i) How can you use venturimeter to measure discharge.

   j) Define steady and unsteady flow.

PART – B **(5 x14 = 70 Marks)**
(Answer any five of the following)

2. a) Deduce the expression for Reynolds number with the help of dimensional analysis.

   b)The pressure difference Δp in a pipe of diameter D and length l due to turbulent flow depends on the viscosity μ, density and roughness k . Using uckinghham's π theorem obtain an expression for Δp

(6 +8)

3. a) Explain newton's law of viscosity.What are real and ideal fluids ? **(7)**

   b) A 15 cm diameter vertical cylinder rotates concentrically inside another cylinder of diameter 15.10 cm. oth cylinders are 25 cm high. The space between the cylinders is filled with a liquid whose viscosity is to be determined. If a torque of 1.20 kg m is required to rotate the inner cylinder at 100 r.p.m., determine the viscosity. **(7)**

4. a) Derive Bernoulli's equation of motion. **(7)**

   b) The water is flowing through a taper pipe of length 100 m having diameters 60 cm at the upper end and 30 cm at the lower end, at the rate of 50 litres/sec. The pipe has a slope of 1 in 30 . Find the pressure at the lower end if the pressure at the higher end is 2.0 kgf/cm^2 **.** **(7)**

5. a**)** Deduce the expression for the force on the stationary inclined flat plate and find also the horizontal and vertical components of this force.

   b) Calculate the force exerted by a jet of water of diameter 7.5 cm on a stationary flatplate, when the jet strikes the plate normally with a velocity of 20 m/sec. **(8+6)**

6. a**)** Derive the expression for maximum efficiency of transmission of powert in a pipeline..

   b) A pipe of diameter 30 cm and length 3500 m is used for the transmission of power by water. The total head at the inlet of the pipeline is 500m.Find the maximum power available at the outlet of the pipe and take the value of f=.006 **(7+7)**

7. a) Derive the expression for the horse power absorbed to overcome the viscous resistance in a foot-step bearing.

   b) Find the power required to rotate a circular disc of diameter 20 cm at 1000 r. p .m. The circular disc has a clearance of 0.04 cm the bottom flat plate and the clearance contains oil of viscosity 1.05 poise. **(8+6)**

8. Show that in case of a forced vortex, the rise of liquid level at the ends is equal to the fall of liquid level at the axis of rotation. **(14)**

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