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Roll No

MMTP-104**M.E./M.Tech. I Semester**

Examination, June 2016

Advanced Fluid Mechanics*Time : Three Hours**Maximum Marks : 70*

- Note :** i) Attempt any five questions. All questions carry equal marks.
 ii) Assume missing data suitably, if any.
 iii) Draw neat and clean sketches/diagrams/figures wherever required.

1. a) Define the following :
 i) Steady and Unsteady flow
 ii) Uniform and Non-uniform flow
 iii) Laminar and Turbulent flow
 b) Define the following types of fluids :
 Ideal fluid, Real fluid, Newtonian fluid, Non-Newtonian fluid, Ideal Plastic fluid.
2. a) An oil having viscosity of 1.42 poise and specific gravity 0.9 flows through a pipe 25 mm diameter and 300 m long at Reynolds number of 1800. Find the flow through the pipe and the power required to maintain the flow.
 b) A flow field on the xy-plane has the velocity components.
 $u = 3x + y$ $v = 2x - 3y$
 Show that the circulation around the circle $(x - 1)^2 + (y - 6)^2 = 4$ is 4π .
3. a) What do you mean by Reynolds Transport Theorem? State its statement, significance and applications.
 b) What are Flow Nets in fluid mechanics? Draw and discuss.

4. a) Discuss One, Two and Three dimensional flow with examples.
 b) What is Boundary Layer? Define laminar and turbulent boundary layer. Discuss Prandtl's Boundary Layer Equation.
5. Derive an expression for the velocity distribution for viscous flow through a circular pipe. Also sketch the velocity distribution and shear stress distribution across a section of the pipe.
6. a) What are the causes which result in Separation of Boundary Layer? Explain.
 b) Glycerin of viscosity 0.88 N/m^2 and specific gravity 1.26 is pumped through a horizontal pipe of diameter 30 mm at a flow rate of 50 lit/min. Determine whether the flow is laminar or turbulent. Find also the pressure loss due to the frictional resistance in a length of 9 m and the power required.
7. A turbine is to operate under a head of 25 m at 200 rpm. The discharge is $9 \text{ m}^3/\text{sec}$. If the efficiency is 90%, determine :
 a) Specific speed of the machine,
 b) Power generated,
 c) Type of turbine,
 d) Performance under a head of 20 meters
8. Write short notes on following : (any two)
 a) Superposition of elementary flows
 b) Laminar and turbulent boundary layer
 c) Stagnation and sonic properties
 d) Prototype testing of centrifugal pumps
 e) Hydraulic pump and Its applications
