Total No. of Printed Pages:2

SUBJECT CODE NO:- P-85
FACULTY OF ENGINEERING AND TECHNOLOGY
T.E.(Mechanical) Examination MAY/JUNE-2016
Fluid Mechanics [only for Part-I]
(Revised)

[Time:Three Hours] **[Max Marks:80]**

"Please check whether you have got the right question paper."

N.B i) Solve any three questions from each section.
ii) Use of non-programmable calculator is permitted.
iii) Assume suitable missing data.

SECTION: A

Q.1 a) Define the following properties of fluid. 05
Density, weight density, specific volume and specific gravity of a fluid.

b) Two large plane surfaces are 2.4cm apart. The space between the surfaces is filled with glycerin. What force is required to drag a very thin plate of surface area 0.5 m^2 between the two large plane surfaces at a speed of 0.6m/s if: 08
a) The thin plate is middle of the two plane surfaces, and
b) The thin plate is at a distance of 0.8cm from one of the plane surfaces?
Take the dynamic viscosity of glycerin=8.10×10^{-1} N-s/m^2.

Q.2 a) Define the equation of continuity. Obtain an expression for continuity equation for a three-dimensional flow. 05

b) Water flows through a pipe AB 1.2m diameter at 3 m/s and then passes through a pipe BC 1.5m diameter. At C, the pipe branches. Branch CD is 0.8m in diameter and carries one-third of flow in AB. The flow velocity in branch CE is 2.5m/s. Find the volume rate of flow in AB, the velocity in BC, the velocity in CD and the diameter of CE. 08

Q.3 a) A circular plate 3.0m diameter is immersed in water in such a way that it's greatest and least depth are below free surface at 4m and 1.5m respectively. Determine the total pressure on one face of the plate and position of the Centre of pressure. 08

b) State and explain types of fluid flow. 05

Q.4 a) The stream function for a two-dimensional flow is given by $\psi=2xy$, calculate the velocity at the point p(2, 3). Find the velocity potential function$\emptyset$. 06

b) A 300mm diameter pipe carries water under a head of 20 meters with a velocity of 3.5m/s. if the axis of the pipe turns through 450. Find the magnitude and direction of the resultant force at the bend. 07

Q.5 a) What is venturimeter? Derive an expression for the discharge through a venturimeter. 06

b) A pipe of diameter 400mm carries water at a velocity of 25 m/s. the pressure at the point A and B are given as 29.43 N/cm^2 and 22.563 N/cm^2 respectively, while the datum head at A and B are 28m and 30m. find the loss of head A and B. 08

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SECTION:B

Q.6 a) What do you mean by boundary layer separation? What is the effect of pressure gradient on boundary layer separation? 06

b) Define the terms: 07

i) Boundary layer thickness
ii) Momentum thickness
iii) Energy thickness
iv) Displacement thickness

Q.7 a) Find the displacement thickness, momentum thickness and energy thickness for the velocity distribution in the boundary layer given by $\frac{u}{U} = \frac{y}{\delta}$, where u is the velocity at a distance y from the plate and u=U at y=δ,where δ=boundary layer thickness. 06

b) For the velocity profile for laminar boundary layer flows given as by $\frac{u}{U} = 2\left(\frac{y}{\delta}\right) - \left(\frac{y}{\delta}\right)^2$. Find an expression for boundary layer thickness, shear stress and co-efficient of drag in terms of Reynolds number. 07

Q.8 a) Derive an expression for loss of head due to sudden enlargement. 05

b) An oil of sp. gr. 0.7 is flowing through a pipe of diameter 300mm at the rate of 500 liters/s. Find the head lost due to friction and power required to maintain the flow for a length of 1000m. Take v=0.29 stokes. 08

Q.9 a) A pipe line 60cm diameter bifurcates at a Y-junction into two branches 40cm and 30cm in diameter. If the rate of flow in main pipe is 1.5m^3/s and mean velocity of flow in 30cm diameter pipe is 7.5m/s. determine the rate of flow in the 40cm diameter pipe. 06

b) What are the methods of dimensional analysis? Describe the Rayleigh's method for dimensional analysis. 07

Q.10 a) Explain the terms: Distorted models and undistorted models. What is the use of distorted model? 07

b) The pressure difference Δp in a pipe of diameter D and length L due to viscous flow depend on the velocity V, viscosity μ and density p. using Buckingham's π- theorem obtain an expression for Δp. 07