

Code No: RT22034

R13**SET - 1**

II B. Tech II Semester Supplementary Examinations, April-2018
FLUID MECHANICS AND HYDRAULIC MACHINERY
(Com. to ME, AME)

Time: 3 hours

Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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**PART-A**

1. a) Explain the effect of temperature and pressure on viscosity.  
b) Differentiate between rotational and irrotational flows.  
c) Briefly explain the characteristics of turbulent boundary layer.  
d) How does a volute casing differ from a vortex casing for the centrifugal pump?  
e) Why does a Pelton wheel not possess any draft tube? (4M+4M+6M+4M+4M)

**PART-B**

2. a) What is the disadvantage in having very high meta-centric heights for passenger ships? Explain.  
b) A rectangular plate 0.7 m wide and 1.6 m deep is submerged in water in an inclined position. The maximum and minimum depths of the plate are 1.8 m and 0.8 m from the free surface. Calculate the hydrostatic force on one face of the plate, and the depth of centre of pressure. (7M+9M)
3. a) State the assumptions made while deriving Darcy Weisbach equation.  
b) For steady incompressible flow verify whether the following values of u and v are possible:  
i)  $u = 6xy + 2y^2$ ,  $v = 7xy + 5x$       ii)  $u = x^2 + y^2$ ,  $v = -4xy$   
iii)  $u = -2x/(x^2 + y^2)$ ,  $v = -2y/(x^2 + y^2)$ . (6M+10M)
4. The velocity profile for laminar boundary layer flow is given as  $u/U = 4(y/\delta) - 2(y/\delta)^2$ . Find an expression for boundary layer thickness and shear stress. (16M)
5. The jet velocity in a Pelton turbine is 70 m/s. The peripheral velocity of the runner is 30 m/s. The jet is deflected by  $140^\circ$  by the bucket. Determine the work done, power developed and hydraulic efficiency of the turbine for a flow rate of  $0.9 \text{ m}^3/\text{s}$ . The blade friction coefficient is 0.85. (16M)
6. Write short notes on  
a) Impellers    b) Centrifugal pump characteristics (8M+8M)
7. a) Why is the end of a draft tube immersed below the tail water level? Explain with a neat sketch. Define draft tube efficiency and derive its equation.  
b) Explain the working, advantages, limitations and applications of hydraulic ram. (8M+8M)