SUBJECT CODE NO:- 320
FACULTY OF ENGINEERING AND TECHNOLOGY
T.E.(Mech) Examination Nov/Dec 2015
Fluid Mechanics & Machinery
(Revised)-I

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

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

N.B i) Solve ant three questions from section A and any three from section B.
ii) Assume suitable data, if necessary.

Section A

Q.1 a) Explain briefly surface tension and compressibility. 05
b) A 350 rpm diameter shaft is rotating at 200rpm in bearing of length 125mm. if thickness of oil filing is 1.5mm and dynamic viscosity of oil is 0.7 N-S/m^2, determine. 08
i) Torque required to overcome friction in bearing
ii) Power utilized in overcoming viscous resistance
Assume linear velocity profile.

Q.2 a) Define and explain metacentre and metacentric height. 05
b) A solid of 250mm diameter and 800mm length has its base 20mm thick and of specific gravity 6. The remaining part of cylinder is of specific gravity 0.6. State, if it can float vertically in water. 08

Q.3 a) What is Euler's equation of motion? How will you obtain Bernoulli's equation from it? 06
b) A horizontal venturimeter with inlet diameter 25cm and throat diameter 12cm is used to measure the flow of oil of sp. Gr. 0.8. the discharge of oil through verturimeter is 50 liters/ second. Find the reading of the oil-mercury differential manometer. Take cd=0.98. 07

Q.4 a) Describe the Rayleight's method for dimensional analysis. 06
b) Prove that the shear stress (z) in a fluid flowing through a pipe can be expresses by the equation. 07

$$z = \varrho V^2 \emptyset \left[\frac{\mu}{\varrho\, DV}, \frac{K}{D}\right]$$

Where
D=diameter of pipe
ϱ= mass density
V= velocity
μ= viscosity
K=height of roughness projection

Q.5 Answer any 2 of the following. 14
a) Explain significance of dimensionless number
b) Explain CFD as research tool
c) What is capillarity? Derive an expression for height of capillary rise.

Section-B

Q.6 a) Prove that for a curved radial vane the efficiency is given by 06

$$\eta = \frac{2(V_{w1}u_1 \pm V_{w2}\, u_2)}{V_1^2}$$

b) A jet of water of diameter 75mm moving with a velocity of 20m/s strikes a fixed plate in such a way that the angle between the jet and plate is 60^0. Find the force excreted by the jet on plate 07
i) in the direction normal to the plate ii) in the direction of plate.

Q.7 A single jet Pelton wheel runs at 300rpm under a head of 520m. The jet diameter is 200mm; its deflection indie bucket is $165^0$and its relative velocity is reduced by 15% due to friction. Determine. 13

i) Water power ii) Resultant force on bucket iii0 Overall efficiency

Take mechanical losses= 3.5%.

coefficient of velocity = 0.98

Speed ratio = 0.46.

Q.8 a) List the main component parts of centrifugal pump and explain them briefly. 05

b) The diameter of centrifugal pump impeller is 300 mm and its width is 600 mm, the pump delivers 120 liters/s, with manometric efficiency of 87%. The effective outer vane angle is 30^0. If speed of rotation is 1000 rpm. Calculate specific speed of pump. 08

Q.9 a) Describe with neat sketch, the working of hydraulic press. 05

b) The pressure intensity of liquid supplied to an intensifier is 50 bar while the pressure intensity of liquid leaving the intensifier is 150 bar. If the intensifier has a capacity of 0.025m3 and stroke 1.25m, calculate the diameters of the fixed ram and sliding cylinder to be used for this intensifier. 08

Q.10 a) Describe with the aid of neat sketch, the working of hydraulic intensifier. 07

b) How are small and large centrifugal pumps primed? 07