R16

Code No: 134BC

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year II Semester Examinations, April - 2018
FLUID MECHANICS AND HYDRAULIC MACHINES
(Common to ME, MSNT)

Time: 3 Hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit.
Each question carries 10 marks and may have a, b, c as sub questions.

PART- A

(25 Marks)

1.a)	Explain Newton's law of viscosity.	[2]
b)	Define absolute, gauge and vacuum pressures.	[3]
c)	What is meant by surface and body forces?	[2]
d)	Explain rotational and irrotational flows with practical examples.	[3]
e)	Define HGL and TEL.	[2]
f)	What is meant by pipes in series and pipes in parallel?	[3]
g)	What is hydrodynamic force?	[2]
h)	Differentiate impulse and reaction turbines.	[3]
i)	List out the losses in pumps.	[2]
j)	Explain what an indicator diagram is.	[3]

PART-B

(50 Marks)

2. Differentiate between:
a) Liquids and Gases
b) Cohesion and Adhesion
c) Real fluid and Ideal fluid
d) Compressible and Incompressible fluids. [10]

OR

3.a) Enunciate Newton's law of viscosity. Explain the importance of viscosity in fluid motion. What is the effect of temperature on viscosity of water and that of air?

b) An oil of viscosity 5 poise is used for lubrication between a shaft and sleeve. The diameter of shaft is 0.5 m and it rotates at 200 rpm. Calculate the power lost in the oil for a sleeve length of 100 mm. The thickness of the oil film is 1.0 mm. [5+5]

4.a) Explain the terms: (i) Path line (ii) Streak line (iii) Stream line and (iv) Stream tube.

b) A 40 cm diameter pipe, conveying water, branches into two pipes of diameter 30 cm and 20 cm respectively. If the average velocity in the 40 cm diameter pipe is 3 m/s. Find the discharge in this pipe. Also, determine the velocity in 20 cm pipe if the average velocity in 30 cm diameter pipe is 2m/sec. [5+5]

OR

5.a) Derive Bernoulli's equation from Euler's equation.

b) A 42^0 reducing bend is connected in a pipe line, the diameters at the inlet and outlet of the bend being 40 cm and 20 cm respectively. Find the force exerted by water on the bend if the intensity of pressure at inlet of bend is 20.00 N/cm^2. The rate of flow of water is 550 litres/s. [5+5]

6.a) Show that the loss of head due to sudden expansion in pipe line is a function of velocity head.

b) Describe the characteristics of laminar and turbulent boundary layers. [5+5]

OR

7.a) What is a Venturimeter? Derive an expression for the discharge through a Venturimeter.

b) Explain Reynold's experiment with a neat sketch. [5+5]

8.a) What is specific speed? State its significance in the study of hydraulic machines.

b) By means of a neat sketch, explain the governing mechanism of Francis Turbine. [5+5]

OR

9.a) What do you mean by gross head, net head and efficiency of turbine. Explain the different types of efficiencies of a turbine.

b) A Pelton wheel has a mean bucket speed of 30 m/s with a jet of water flowing at the rate of 0.8 m^3/s under a head of 250 m. The buckets deflect the jet through an angle of 160^0. Calculate the power delivered to the runner and the hydraulic efficiency of the turbine. Assume co-efficient of velocity as 0.85. [5+5]

10.a) How will you determine the possibility of cavitation to occur in the installation of a pump.

b) What are pump troubles and remedies? Explain. [5+5]

OR

11.a) Explain the principle and working of a Centrifugal pump with a neat sketch.

b) A centrifugal pump delivers water against a net head of 14.5m and design speed of 1000 rpm. The vanes are curved back to an angle of 30^0 with periphery. The impeller diameter is 300 mm and outlet width 50 mm. Determine the discharge of the pump if the manometric efficiency is 95%. [5+5]

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