Code No: 113BX **R13**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, March - 2017
FLUID MECHANICS AND HYDRAULIC MACHINERY
(Electrical and Electronics Engineering)

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) Why a falling rain drop acquires spherical shape. [2]
b) If the surface tension at air water interface is 0.073 N/m. What is the pressure difference between inside and outside of an air bubble of diameter 0.01 mm. [3]
c) Explain the differences among the stream line. Streak line and path line. What will happen to all the lines when the flow is steady? [2]
d) List out all minor and major losses in pipe flow. [3]
e) What is meant by velocity diagrams? What are the uses of it? [2]
f) What is mass curve and what are the uses of it? [3]
g) Distinguish between impulse and reaction turbines. [2]
h) What is meant by governing of a turbine? [3]
i) State the differences between the single stage and multi stage pumps. [2]
j) What do you mean by net positive suction head? (NPSH). [3]

PART-B

(50 Marks)

2.a) Explain the micro manometer with a neat diagram. Discuss the main advantages of the same.
b) Castor Oil of viscosity 0.9 N-S/m^2 fills the space between two concentric cylinders of 15 cm and 15.2 cm and each 25 cm height. Find the torque required to rotate the inner cylinder at 20 rpm if the outer cylinder is stationary. [5+5]

OR

3.a) Discuss various types of classification of flows. Mention their practical applications.
b) Derive continuity equation and clearly state the assumptions made. [5+5]

4.a) Explain the forces on a 90^0 bend with neat sketch.
b) Explain the following with neat sketches:
i) Orifice meter ii) Nozzle meter iii) Pitot tube. [5+5]

OR

5.a) Derive the Darcy Weisbach equation.
b) Two reservoirs connected by a pipe line consisting of two pipes in series one of 15 cm diameter and 6 m long and another 22.5 cm diameter and 15 m long. If the difference in the level of reservoirs is 6.0 m, calculate the discharge by considering all losses. Take f = 0.020 for each pipe. [5+5]

6. Derive the expressions for work done and efficiency in respect of a jet striking curves vanes at the centre. [10]

OR

7.a) Discuss the step by step procedure of estimation of power developed from a catchment.

b) Explain the various elements associated with hydro electric power stations. [5+5]

8.a) A Francis turbine of diameter 3.0 m develops 6750 KW at 300 rpm under a net head of 45 m. A geometrically similar model of scale ratio 1:8 is to be tested at ahead of 9 m. Estimate the size, speed, discharge and power developed by the model. What is the specific speed of the model?

b) Explain the features of governing mechanism of turbine. [5+5]

OR

9.a) What is Cavitation phenomenon? Discuss how does it occurs and prevention methods.

b) A Kaplan turbine working under a head of 15 m develops 7400 KW shaft power. The outer diameter of the runner is 4 m and the hub diameter is 2 m. the guide blade angle at the extreme edge of the runner is 30^0. The hydraulic and overall efficiency are 90% and 85% respectively. If the velocity of the whirl (Vw1) at the outlet is zero , determine the runner vane angles at the inlet and outlet at the extreme edge of the runner and speed of turbine. [5+5]

10.a) A two stage centrifugal pump is required for a fire engine for a discharge of 3.66 m^3 per minute at ahead of 75 m. if the overall efficiency of the pump is 75% and specific speed per stage is about 1300 find i) the running speed in rpm and ii) the power of the driving engine. If the actual manometric head developed is 65% of the theoretical head , there is no slip , the outlet vane angle is 30^0 and the radial flow velocity at exit is 0.15 times the tip speed at exit find the diameter of the impellers.

b) Enlighten the characteristic curves of centrifugal pumps. [5+5]

OR

11.a) Derive an expression for specific speed of a centrifugal pump.

b) Describe the principle and working of a centrifugal pump with a neat sketch. [5+5]

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