Code No: 124DF

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year II Semester Examinations, May - 2017

MECHANICS OF FLUIDS AND HYDRAULIC MACHINES

(Common to ME, MIE, 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) Mention the advantages of centrifugal pumps. [2]
b) Discuss the importance of priming in pumps. Can priming be avoided in pumps? [3]
c) Define Specific Speed of a Pump. [2]
d) Summarize the classification of turbines. [3]
e) Discuss how you measure the pressure between two different points using differential manometer? [2]
f) Examine critically one Dimensional and three Dimensional flows. [3]
g) Illustrate the measurement velocity using Pitot tube. [2]
h) Discuss the phenomenon of Cavitation in turbines. How do you control the same? [3]
i) How do you measure Pressure on curved surfaces? [2]
j) Explain the characteristics of laminar and turbulent layer. [3]

PART-B

(50 Marks)

2.a) Explain the following terms:
i) Specific weight ii) Vapour pressure iii) atmospheric pressure.
b) A hydraulic lift is used for lifting automobiles has a diameter ram which slides in a 25.018 cm diameter cylinder, the annular space being filled with oil having a kinematic viscosity of 3.7 cm^2/s . Find the frictional resistance when 3.3 m of ram is engaged in the cylinder. [5+5]

OR

3.a) The relative density of a fluid is 1.26 and its dynamic viscosity is 1.5 Pa.s. Calculate its:
i) Specific Weight ii) Kinematic viscosity.
b) A 90 mm diameter shaft rotates at 1200 rpm in a 100 mm long journal bearing of 90.5 mm internal diameter. The annular space in the bearing filled with oil having a dynamic viscosity of 0.12 Pa.s. Estimate the power dissipated as heat. [5+5]

4.a) Explain in detail the classification of flows with examples.
b) Derive the Bernoulli's Energy equation from fundamental principles, Clearly state the assumptions and limitations of the same. [5+5]

OR

5.a) Explain the forces on a 90^0 bend with neat sketch and analyze the same using Momentum Equation.

b) Gasoline which has a vapour pressure of 5.5×10^4 Pa (abs) and density 680 kg/m^3 flows through a constriction in a pipe where the diameter is reduced from 20 cm to 10 cm. The pressure in the 20 cm pipe just upstream of the constriction is 50 k Pa. If the atmospheric pressure is 75 cm of mercury, calculate the maximum discharge that can be passed through this constriction without cavitation occurring. [5+5]

6.a) A pipe carrying water has a 30 cm × 15 cm Venturimeter which is positioned inclined a 30^0 to the horizontal. The flow is upwards. The converging cone is 45 cm in length and the Cd of the meter is 0.98. A differential U-tube manometer with mercury as indicating fluid is connected to the inlet and to the throat and shows a differential column height of 30 cm calculate i) the discharge in the pipe ii) if the pressure in the inlet section is 50 k Pa, determine the pressure at the throat iii) Find the head loss in the converging section of the Venturimeter.

b) Explain the boundary layer characteristics along thin plate, bring out essential important points. [5+5]

OR

7.a) A 30 cm diameter pipe is required for a town's water supply. As pipes of this diameter are not available in the market, it was decided to lay two parallel pipes of equal diameter. Find the diameter of the parallel pipes. Assume f is same for all the pipes.

b) Derive the Darcy Weisbach equation for pipe flow system. [5+5]

8.a) A jet water 75 mm in diameter having velocity of 20 m/s strikes a series of flat plates arranged in around the periphery of a wheel such that each plate appears successively before the jet. If the plates are moving at velocity of 5 m/s. Compute the force exerted by the jet on the plate, the work done per second on the plate and the efficiency of the jet.

b) What is water hammer? Obtain en expression for the rise in pressure in a thin elastic pipe of circular section in which the flow of water is stopped by sudden closure of valve. [5+5]

OR

9.a) Derive the draft tube efficiency formula in case of reaction turbine and state the functions.

b) What do you understand by governing of hydraulic turbines? Also describe with sketches different types of surge tanks. [5+5]

10.a) Define the following in case of Centrifugal pumps i) Manometric efficiency ii) Volumetric efficiency iii) Mechanical efficiency iv) Specific speed.

b) Describe the characteristics curves of pumps with neat diagrams. [5+5]

OR

11.a) Define the term NPSH. Discuss the various provisions required for prevention of cavitation.

b) Explain the functions of air vessels in a reciprocating pump. [5+5]

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