

R16

Code No: 134BA

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year II Semester Examinations, April - 2018

FLUID MECHANICS – II

(Common to CE, CEE)

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) List the types of flow in open channel. [2]
- b) Explain energy and momentum correction factors. [3]
- c) State Rayleigh's method of dimensional analysis. [2]
- d) What is scale effect? [3]
- e) What is a radial vane? [2]
- f) What is work done and efficiency? [3]
- g) Define the speed ratio and flow ratio of Francis turbine. [2]
- h) What is governing of turbines? [3]
- i) Define the terms utilization factor and capacity factor. [2]
- j) What is manometric head? [3]

PART – B

(50 Marks)

- 2.a) Water flows in a rectangular, concrete, open channel that is 12 m wide at a depth of 2.5 m. The channel slope is 0.0028. Find the water velocity and the flow rate. ( $n = 0.013$ )

- b) Explain the concept of critical flow. [5+5]

OR

- 3.a) The velocity distribution in a very wide river of 3 m deep is given by

$$v = 1 + 2 \left( \frac{y}{y_0} \right)^{1/2}$$

Find  $\alpha$  and  $\beta$ .

- b) A rectangular channel carries a flow with a velocity of 0.65 m/s and depth of 1.40 m. If the discharge is abruptly increased three fold by a sudden lifting of a gate on the upstream, estimate the velocity and the height of the resulting surge. [5+5]

- 4.a) What are different similarities which should exist between models and prototypes.

- b) Define and explain distorted and undistorted models. [5+5]

OR

- 5.a) State Buckingham's  $\pi$  theorem. What are repeating variables? How are these selected in dimension analysis?

- b) Explain the relation between a model and prototype. [5+5]

- AG AG AG AG AG AG AG A
- 6.a) Derive the expression for force exerted by jet striking centrally and at tip.  
b) What are radial flow turbines? List all the applications of radial flow tubes. [5+5]

OR

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7. A jet of water, having a velocity of 15 m/s, strikes a curved vane which is moving with a velocity of 6m/s in the same direction as that of the jet at inlet. The vane is so shaped that the jet is deflected through 135°. The diameter of the jet is 150 mm. Assuming the vane to be smooth, find:  
a) The force exerted by the jet on vane  
b) Power of vane  
c) Efficiency of vane. [10]

- AG AG AG AG AG AG AG A
- 8.a) With the help of neat sketch explain the construction and operation of Francis turbine.  
b) Why specific speed is called "type characteristics"? Classify hydroturbines as per specific speed. [5+5]

OR

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- 9.a) How are work output and hydraulic efficiency calculated from velocity diagrams?  
b) A Kaplan turbine develops 10,000 kW under of 4.3 m. Find the diameter and speed of the turbine if the speed ratio is 1.8 flow ratio is 0.5, boss diameter as 0.36 times the outer diameter and overall turbine efficiency is 90%. [5+5]

- AG AG AG AG AG AG AG A
- 10.a) Discuss the classification of centrifugal pumps as per specific speed and working head.  
b) What is cavitation? What is NPSH? How are cavitation and NPSH correlated? [5+5]

OR

- AG AG AG AG AG AG AG A
- 11.a) Explain the various performance characteristics of a pump for the following:  
i) Main Characteristics  
ii) Operating Characteristics  
iii) Universal Characteristics.  
b) Explain the working of reciprocating pumps. [5+5]

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