

**R16**

Code No: 134BA

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year II Semester Examinations, May - 2019

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 as sub questions.

**PART – A****(25 Marks)**

- 1.a) Find the discharge through a rectangular channel of width 2 m, having bed slope of 4 in 8000. The depth of flow is 1.5 m and take the value of N in Manning's formula as 0.012. [2]
- b) What do you understand by surges and how would you classify them? [3]
- c) State the advantages of model testing. [2]
- d) List out the merits and demerits of distorted models. [3]
- e) Find the force exerted by a jet of water of diameter 65 mm on a stationary flat plate, when the jet strikes the plate normally with velocity of 20 m/s. [2]
- f) A jet of water of 4.5 cm diameter, moving with a velocity of 20 m/s, strikes a hinged square plate of weight 98.1 N at the centre of the plate. The plate is of uniform thickness. Find the angle through which the plate will swing. [3]
- g) Define specific speed? State its significance in the study of hydraulic machines. [2]
- h) Differentiate between an inward and an outward flow reaction turbine. [3]
- i) What are the advantages of centrifugal pump over reciprocating pumps? [2]
- j) Explain the terms-load factor, utilization factor and capacity factor. [3]

**PART – B****(50 Marks)**

2. State and prove the conditions under which the rectangular section of open channel will be most economical. [10]

**OR**

3. Explain the term hydraulic jump. Derive an expression for the depth of hydraulic jump in terms of the upstream Froude number. [10]

- 4.a) What do you mean by dimensionless numbers? Describe any four dimensionless numbers.
- b) In the model test of a spillway the discharge and velocity of flow over the model were  $2.5 \text{ m}^3/\text{s}$  and  $1.5 \text{ m}^3/\text{s}$  respectively. Calculate the velocity and discharge over the prototype which is 36 times the model size. [5+5]

**OR**

5. Describe Buckingham's method of  $\pi$ -theorem to formulate a dimensionally homogeneous equation between the various physical quantities effecting a certain phenomenon. [10]

U1 6. Show that for a curved radial vane, the work done per second is given by,  $\rho a V_1 [V_{w1} u_1 \pm V_{w2} u_2]$  [10]

OR

7. A jet of water 75 mm diameter having a velocity of 20 m/s, strikes normally a flat smooth plate. Determine the thrust on the plate (a) if the plate is at rest, (b) if the plate is moving in the same direction as the jet with a velocity of 5 m/s. Also find the work done per second on the plate in each case and the efficiency of the jet when the plate is moving. [10]

U1 8. What is governing and how it is accomplished for different types of water turbines? [10]

OR

9. A pelton wheel has to be designed for the following data. Power to be developed = 6,000 kW. Net head available = 300 m; speed = 550 r.p.m; Ratio of jet diameter to wheel diameter = 1/10; and overall efficiency = 85%. Find the number of jets; diameter of the jet; diameter of the wheel and the quantity of water required. [10]

U1 10. What is the difference between single-stage and multistage pumps? Describe multistage pump with impeller in parallel. [10]

OR

11. A three stage single centrifugal pump has impeller 400 mm in diameter and 20 mm wide at outlet. The vanes are curved back at the outlet at  $45^\circ$  and reduced the circumferential area by 10 percent: The manometric efficiency is 90 percent and the overall efficiency is 80 percent. The pump is running at 1000 r.p.m. and delivering  $0.05 \text{ m}^3/\text{s}$ . Determine:  
a) Head generated by the pump, and  
b) Shaft power required to run the pump. [5+5]

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