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VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

B.E. (Civil Engg.) III Year I-Semester Supplementary Examinations, May/June-2018

Fluid Mechanics-II

Time: 3 hours Max. Marks: 70

*Note: Answer **ALL** questions in **Part-A** and any **FIVE** from **Part-B***

Part-A (10 × 2 = 20 Marks)

1. Briefly explain the significance of velocity distribution in open channels.
2. Enumerate the conditions required to consider a trapezoidal channel to be most economical.
3. State the characteristics of flow profiles in gradually varied flows.
4. Illustrate by means of neat sketches, the essential difference between gradually varied and rapidly varied flows.
5. What is the displacement thickness in boundary layer theory?
6. Calculate the Reynolds number at the trailing edge for a plate 2m wide, 2m long moving in oil (specific gravity = 0.86 and kinematic viscosity = 10^{-5} m^2/s) at the velocity of 3.5m/s.
7. Define stream lined body.
8. List the advantages of the model analysis.
9. What is Cavitation? How it is avoided in reaction turbines?
10. How does the specific speed of a pump differ from that of a turbine?

Part-B (5 × 10 = 50 Marks)

11. a) A trapezoidal channel with side slope 1 : 1 has to be designed to convey $10m^3/s$ at a Velocity of 2m/s so that the amount of concrete lining of bed and sides is minimum. Calculate the area of lining required for one metre length of canal. [6]

    b) Derive the equation to calculate discharge through an open channel using Chezy's formula. [4]

12. a) A sluice gate discharges water in to a horizontal rectangular channel with a velocity of 10m/s and depth of flow of 1m. Determine the depth of flow after jump and consequent loss of energy. [5]

    b) Obtain the relationship for hydraulic jump in a horizontal rectangular channel. [5]

13. a) A flat plate 1.2m X 1.2m moves at 50 kmph in stationery air of density $1.15kg/m^3$. If coefficient of drag and lift are 0.2 and 0.6 respectively. Determine: i) lift force ii) drag force and iii) power required to keep plate in motion. [5]

    b) Discuss in detail any two methods of preventing the separation of boundary layer. [5]

14. a) Discuss the factors responsible for selecting the repeating variables in Buckingham's π – theorem. [5]

    b) In a 1 in 40 model of a spillway the velocity and discharge are 2m/s and $3m^3/s$. Calculate the corresponding velocity and discharge in prototype. [5]

15. a) By means of a neat sketch, explain the functioning mechanism of Francis Turbine. [4]

    b) A centrifugal pump is running at 1375rpm. The outlet vane angle of the impeller is 30° and the velocity of flow at outlet is 3.7m/s. The pump is working against a total head of 30m anf the discharge through the pump is 0.4cumec. If the manometric efficiency is 75%, determine the diameter of the impeller and the width of the impeller at the outlet. [6]

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16. a) Find the discharge through a rectangular channel of width 5.5m and critical depth of the water, if the critical velocity is 3.5m/s. Also determine the value of minimum specific energy. [5]

    b) Explain various surges possible in open channel. [5]

17. Answer any ***two*** of the following:

    a) Define the terms: laminar boundary layer and laminar sub-layer. [5]

    b) Explain Geometric similarity and Dynamic similarity. [5]

    c) Differentiate between volute casing and vortex casing for a centrifugal pump. [5]

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