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VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

B.E. (Civil Engg.) III Year I-Semester Main & Backlog Examinations, December-2017

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. Write the classification of flows in open channels.
2. What is the relation between Manning's and Chezy's equation?
3. By means of practical applications, show Mild slope.
4. State the assumptions made in the derivation of momentum equation for jump.
5. Define the term: Turbulent Boundary layer.
6. Write the effect of pressure gradient on boundary layer separation.
7. State Buckingham π-theorem.
8. What is distorted model?
9. A turbine develops 8050kW power under a head of 25m at 140rpm. Calculate the specific speed of the turbine and state the type of turbine.
10. List various pump characteristics.

Part-B (5 × 10 = 50 Marks)

11. a) A trapezoidal channel has side slopes of 1 horizontal to 2.5 vertical and the bed slope is 1 in 2200. The area of the section is $42m^2$. Find the dimensions of the section if it is most economical. Also determine the discharge of the most economical channel if C = 60 and also with n = 0.025. [6]

    b) Write the conditions of critical flow. [4]

12. a) Derive the dynamic equation of gradually varied flow listing the assumptions. [5]

    b) The specific energy for a 6m wide rectangular channel is to be 7kg-m/kg. If the rate of flow through the channel is 27.5cumec, determine the alternative depths, head loss due to jump. [5]

13. a) Explain the phenomena of boundary layer separation. [5]

    b) A truck having projected area of $6.5m^2$ travelling at 70kmph has a total resistance of 2000N. Of this 20% is due to rolling friction and 10% is due to surface friction. The rest is due to form drag. Calculate the coefficient of form drag. Take density of air as 1.25 kg/m^3 [5]

14. a) Explain Rayleigh's method of dimensional analysis. [5]

    b) The pressure difference (Δp) in a pipe of diameter (D) and length (l) due to viscous flow depends on the velocity (V), viscosity (μ) and density (ρ). Using Buckingham Π theorem: Obtain an expression for Δp. [5]

15. a) Derive the equation to estimate the minimum speed for starting of a centrifugal pump. [5]

    b) A reaction turbine works at 500rpm under a head of 100m. The diameter of the turbine at inlet is 100cm and the flow area is $0.335m^2$. The angles made by absolute and relative velocities at inlet are 15° and 60° respectively with the tangential velocity. Determine the volume of flow rate, efficiency and the power developed. Assume the whirl at the outlet to be zero. [5]

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16. a) Find in terms of specific energy E, an expression for critical depth in rectangular channel. [5]

    b) Find the slope of surface in a rectangular channel of width 20m having depth of flow 5m. The discharge through the channel is $50m^3/s$. The bed of the channel is having a slope of 1 in 4000. Take chezy's constant as 60. [5]

17. Answer any *two* of the following:

    a) Explain in detail about supplying additional energy from a blower method of preventing the separation of boundary layer. [5]

    b) Show that the ratio of inertia force to viscous force gives Reynolds number. [5]

    c) List out various characteristic curves of a turbine and explain in brief about Main characteristic Curves with neat sketches. [5]

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