Total No. of Printed Pages:2

S.E. (Civil) Semester- IV (Revised Course 2007-08)
EXAMINATION NOV/DEC 2019
Fluid Mechanics - II

[Duration : Three Hours] **[Total Marks : 100]**

Instructions:
1) Marks are indicated to the right of the question.
2) Answer any 5 Questions with at least one question from each Module.
3) Assume additional data if required and state them clearly.

MODULE-1

1. a) Distinguish between pipe flow and channel flow. Determine the dimensions and discharge of a most economical trapezoidal section having side slope of 1 horizontal and 2 vertical and the slope of the bed is 1 in 1500. The area of the section is 40 sq. m and Chezy's constant C = 60. **12**

b) Explain using sketches the various gradually varied flow profiles occurring in a channel. **08**

2. a) Define critical depth. Show that for a rectangular channel the critical depth for a given flow corresponds to the conditions of minimum specific energy. **05**

b) A rectangular channel 1.5 m wide carries a discharge of 15 cumecs at a depth of 1.2m. Compute the critical depth and specific energy at this depth. Also find the sequent depth (y_2) and Froude's number corresponding to alternate depths. **08**

c) Write a note on
i) Jump – An energy dissipater.
ii) Type of flow in channels. **07**

MODULE-II

3 a) Design an irrigation canal in clayey alluvial soil for full supply discharge of 36 m^3/s. Chezy's constant = 44, canal side slopes 1:1, longitudinal slope = 1 in 5000. Also check for critical velocity ratio. **10**

b) With the help of a neat sketch explain the working of a chute spillway. State and explain factors affecting selection of a particular material for canal lining. **10**

4 a) A smooth pipe of 50mm diameter and 1000m long is carrying water at the rate of 0.05 m^3/s. If the kinematic viscosity is 0.02 stokes and the value of coefficient of friction 'f' is given by

$$f = \frac{0.0791}{(Re)^{\frac{1}{4}}}$$

Determine i) Loss of head
ii) Wall shearing stress
iii) Centre line velocity
iv) Thickness of laminar sub layer. **10**

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b) Write a note on 'seepage prevention with impermeable membranes. State the causes of failure of canal lining. **10**

MODULE-III

5 a) A 60mm diameter jet having a velocity of 30m/s strikes a flat plate, the normal of which is inclined at 45° to the axis of the jet. Find the normal force on the plate when
i) Plate is Stationary
ii) Plate is moving with a velocity of 12 m/s in the direction of the jet and away from the jet.
iii) Also determine the power and efficiency of the jet when the plate is moving. **08**

b) Derive an expression for minimum starting speed of a centrifugal pump. **06**

c) What are the causes of cavitation? Explain the steps to be under taken to avoid cavitation in turbines. **06**

6 a) A pelton wheel is receiving water from a penstock with a net head of 800m while running at a speed of 600 rpm and developing 13230kW power. If co-efficient of velocity =0.970 and speed ratio=0.46, overall efficiency is 85% and the ratio of jet diameter is 1/16 of wheel diameter,
Determine: i) The diameter of the wheel.
ii) The diameter of the jet.
iii) The quantity of water supplied to the wheel. **10**
iv) The number of jets required.

b) A three cylinder pump has cylinders of 250mm diameter and stoke of 500mm each. The pump is required to deliver 0.1 m^3/s at a head of 100m. Friction losses are estimated to be 1m in suction pipe and 19m in delivery pipe. Velocity of water in delivery pipe is 1m/s, overall efficiency is 85% and slip is 3%. Determine the speed of the pump and power required to run the pump. **08**

c) Explain negative slip of a reciprocating pump. **02**

MODULE-IV

7 a) Write a note on
i) Hydraulic lift **10**
ii) Safety measures taken at hydroelectric power plant.

b) Explain the various types of ocean waves. What are tides? How do tides and waves work? **10**

8 a) Explain using a sketch working of air lift pump. **10**

b) Sketch a typical layout of a hydropower plant. Write a short note on hydropower development in India. **10**

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