PAPER ID : 0050

Paper ID and Roll No. to be filled in your Answer Book

Roll No.

B. Tech.

(SEM. IV) (EVEN SEM.) EXAMINATION, 2013

HYDRAULICS & HYDRAULIC MACHINE

Time : **3** Hours]   [Total Marks : **100**

NOTE :   (i)   All questions are compulsory.

(ii)   All questions carry equal marks.

1   Attempt any FOUR parts of the following :   5×4

(A)   Differentiate between Critical, sub critical and super-critical flow in an open channel.

(B)   What is meant by an economical section of a channel?

(C)   Differentiate between Turbines and pumps.

(D)   What is a draft tube? What are its functions?

(E)   Show that in a rectangular channel, Critical depth is two third of specific energy.

(F)   What is a mobile bed channel.

2   Attempt any FOUR parts of the following   5×4

(A)   Find the critical depth and critical velocity of the water flowing through a rectangular channel of width 5m when discharge is 15 cum/s.

(B) Find an expression for loss of energy head for a hydraulic jump.

(C) What is cavitation? How can it be avoided in reaction turbine?

(D) Define the terms: speed ratio, flow ratio and jet ratio.

(E) Explain positive and negative surges at a sluice gate by sketches.

(F) Derive an expression for the discharge through a channel by Chezy's formula.

3   Attempt any TWO parts of the following :   10×2

(A) Prove that for the trapezoidal channel of most economical section :
   (i)   Half of top width = Length of on of the sloping sides
   (ii) Hydraulic mean depth = ½ depth of flow.

(B) The depth of flow of water, at a certain section of a rectangular channel of 2m width is 0.3 m. The discharge through the channel is 1.5 cum/s. Determine whether a hydraulic jump will occur and if so, find its height and loss of energy per kg of water.

(C) Find the diameter of a circular sewer pipe which is laid at a slope of 1 in 8000 and carries discharge of 800 litres/s when flowing half full. Take the value of Manning's N = 0.020

4   Attempt any TWO parts of the following   10×2

(A) What is specific energy curve? Draw specific energy curve, and then derive expressions for critical depth and critical velocity.

(B) A reaction turbine works at 450 rpm under a head of 120 m. Its diameter at inlet is 120 cm and the flow area is 0.4 sqm. The angles made by absolute and relative velocities at inlet are 20 and 60 deg respectively with the tangential velocity. Determine :
   (i)   The volume flow rate
   (ii) The power developed
   (iii) Hydraulic Efficiency.
   Assume whirl at outlet to be zero.

(C) By means of a neat sketch explain the governing mechanism of Francis Turbine.

5   Attempt any TWO parts of the following   10×2

(A) Obtain an expression for the force exerted by a jet of water on a fixed vertical plate in the direction of the jet.

(B) Derive equation of Gradually varied flow. State the assumptions made.

(C) Write short note on any two of the following:
   (i)   Incipient motion condition in mobile bed channel
   (ii) Use of jump as an energy dissipater
   (iii) Rotodynamic Pumps
   (iv) Deep and shallow water waves.