

B.TECH
(SEM IV) THEORY EXAMINATION 2017-18
HYDRAULICS & HYDRAULIC MACHINES

Time: 3 Hours

Total Marks: 70

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief.

2 x 7 = 14

- a. Define Different types of flow.
- b. Determine the maximum discharge through a rectangular open channel of area 8m^3 with a bed slope of $1/2000$. Assume manning's constant 0.022 .
- c. Define the velocity contour's in open channel flow.
- d. What is the Back Water Curve?
- e. Write the types of Surge.
- f. What assumptions will take in Velocity Triangles?
- g. Write the main Parts of Kaplan Turbines.

SECTION B

2. Attempt any *three* of the following:

7 x 3 = 21

- a. Uniform flow occurs at a depth of 1.5 m in a long rectangular channel 3 m wide and laid to a slope of 0.0009 . If manning's $n=0.015$. Calculate (a) Maximum height of hump on the floor to produce critical depth (b) The width of contraction which will produce critical depth without increasing the upstream depth of flow.
- b. In an open channel, the Froude number F remains constant at all depths. if the specific energy E is constant Show that

$$\frac{T}{B} = \left(\frac{E}{E - h} \right)^{\left(\frac{1+F^2}{2} \right)}$$

- c. Prove that Hydraulically most efficient trapezoidal section is half of regular Hexagon.
- d. Integrate the differential equation of G.V.F. for a Horizontal Channel to get the Profile equation as

$$x = \frac{h_c}{S_c} \left[\frac{\left(\frac{h}{h_c} \right)^{N-M+1}}{N-M+1} - \frac{\left(\frac{h}{h_c} \right)^{N+1}}{N+1} \right] + \text{constt.}$$

- e. What is NPHS of centrifugal Pump? How it is related to cavitation in Pump?

SECTION C

3. Attempt any *one* part of the following: 7 x 1 = 7
- (a) An open channel to be made of concrete is to be designed to carry $1.5 \text{ m}^3/\text{s}$ at a slope of 0.00085. Find the most efficient cross section for (a) Rectangular section (b) Trapezoidal section (c) Semicircular section
 - (b) Define the following with formula (a) Kinetic Energy Correction factor (b) Momentum correction factor
4. Attempt any *one* part of the following: 7 x 1 = 7
- (a) Using Basic differential equation of G.V.F. show that dh/dx is positive for S_1 , M_3 and S_3 Profiles.
 - (b) How you will define Transitions between Sub Critical Flow And Super Critical Flow? Also draw the Diagram.
5. Attempt any *one* part of the following: 7 x 1 = 7
- (a) A rectangular channel carrying a super critical stream is to be provided with a hydraulic jump type of energy dissipater. It is desired to have an energy loss of 5 m in hydraulic jump when inlet Froude's number is 8.5. What are the segment depths of this jump?
 - (b) Derive the relation between velocity and depths of flow where positive surges moving upward.
6. Attempt any *one* part of the following: 7 x 1 = 7
- (a) In order to predict the performance of a large centrifugal pump, a scale model of one sixth size was made with following specifications. Power = 25 KW, $H_{\text{man}} = 7 \text{ mtr}$, $N = 1000 \text{ rpm}$. If prototype works against 22m. Calculate its working speed, the power required to drive it and the ratio of flow rates handled by to pups.
 - (b) Define cavitation. And what precautions taken against Cavitation?
7. Attempt any *one* part of the following: 7 x 1 = 7
- (a) A Pelton wheel is to be designed for the following specification. Shaft power = 11722 KW, Head = 380 mtr, speed = 750rpm, $\eta_o = 86\%$ Jet diameter (d) not to exceed one-sixth of wheel diameter. Determine (i) The wheel Diameter (ii) Number of jet required (iii) Diameter of jet Take velocity ratio $K_{v1} = 0.985$ and speed Ratio $K_{u1} = 0.45$
 - (b) Define different types of efficiency of Hydraulic turbines.