

B.Tech-VIEP CIVIL ENGINEERING

Term-End Examination

December, 2012

**BICE-025 : HYDRAULICS AND HYDRAULIC
MACHINES**

Time : 3 Hours

Maximum Marks : 70

Note : (i) Answer *any seven* questions.

(ii) Answers to be written in *English* only.

(iii) Assume missing data if any. Use of calculator is permitted.

1. (a) Differentiate between the following 6
- (i) Steady Flow and Unsteady flow
 - (ii) Uniform flow and Non-uniform flow
 - (iii) Rapidly varied flow and Gradually Varied flow
- (b) Find the discharge through a trapezoidal 4
channel of width 8m and side slope of 1
horizontal to 3 vertical. The depth of flow
of water is 2.4m and value of chezy's
constant, $C=50$. The slope of the bed of the
channel is 1 in 4000.

2. (a) Explain the following Forms. 6
- (i) Specific energy
- (ii) Critical depth and
- (iii) Critical Velocity
- (b) A rectangular channel of width 4m is having 4
a bed slope of 1 in 1500. Find the maximum
discharge through the channel. Take value
of $C=50$.
3. (a) Show that in a rectangular open channel 5
the critical depth is two thirds of specific
energy.
- (b) Derive the condition for the best side slope 5
of the most economical trapezoidal
channel.
4. The depth of flow of water, at a certain section of 10
a rectangular channel of 2 m wide, is 0.3 m. The
discharge through the channel is $1.5 \text{ m}^3/\text{s}$.
Determine whether a hydraulic jump will occur,
and if so, find its height and loss of energy per
kg of water.
5. Determine the length of the back water curve 10
caused by an afflux of 2.0 m in a rectangular
channel of width 40 m and depth 2.5 m. The slope
of the bed is given as 1 in 11000. Take Manning's
 $N=0.03$.

6. (a) Explain the following : 6
- (i) Hydraulic efficiency of a Turbine.
 - (ii) Mechanical efficiency of turbine.
 - (iii) Volumetric efficiency of turbine
- (b) Define Cavitation in a pump ? What are the effects of Cavitation ? Give the necessary precautions against Cavitation. 4
7. The internal and external diameter of an impeller of a centrifugal pump which is running at 1000 r.p.m, are 200 mm and 400 mm respectively. The discharges through pump is $0.04 \text{ m}^3/\text{s}$ and velocity of flow is constant and equal to 2.0 m/s . The diameters of the suction and delivery pipes are 150 mm and 100 mm respectively and suction and delivery heads are 6 m (abs) and 30 m(abs) of water respectively. If the outlet vane angle is 45° and power required to drive the pump is 16.186 kw, determine : 10
- (a) Vane angle of the impeller at inlet
 - (b) Overall efficiency of the pump and
 - (c) Manometric efficiency of the pump.
8. (a) A turbine develops 9000 kw when running at 10rpm. The head on the turbine is 30 m. If the head on the turbine is reduced to 18 m, determine the speed and power developed by the turbine ? 5

- (b) Differentiate between the following. 5
- (i) Radial and axial flow turbines.
 - (ii) Kaplan and propeller turbines.

9. Write short notes on the following : 2½x4=10

- (a) Speed ratio of a pelton wheel
 - (b) Draft tube and it's functions
 - (c) Specific speed and its significance in the study of hydraulic machines
 - (d) Governing mechanism of Francis Turbine
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