

D 23436-A

(Pages : 2)

Name.....

Reg. No.....

**FIFTH SEMESTER B.TECH. (ENGINEERING) DEGREE
EXAMINATION, DECEMBER 2011**

CE 04 506—OPEN CHANNEL HYDRAULICS AND HYDRAULIC MACHINERY

(2004 Scheme)

Time : Three Hours

Maximum : 100 Marks

Answer all the questions.

- I. 1 Prove that for a most economical rectangular channel the the hydraulic radius is half the depth of flow.
2 Define critical flow and specific energy in open channel.
3 Explain all possible surface profiles in non-uniform flow
4 What is a stage discharge curve ? How is it developed ?
5 At what condition, a hydraulic jump will occur and where all it is possible ?
6 What are surges and how are they classified ?
7 How are turbines classified ?
8 Describe the working of :
(i) Jet Pump. (ii) Gear Pump.

(8 × 5 = 40 marks)

- II. A (i) A trapezoidal channel having the side slope equal to 60° with the horizontal and laid on a slope of 1 in 800, carries a discharge of $10 \text{ m}^3/\text{s}$. Find the width of the base and depth of flow for most economical section. Take Chezy's C as 64.

(10 marks)

- (ii) Describe the working of a standing wave flume.

(5 marks)

Or

- B (i) Derive the condition for the most economical circular section for maximum mean velocity.

(8 marks)

- (ii) Calculate the discharge of water through a channel having a semicircular bottom of 3 m. and two sides as vertical when the depth of flow is 2.8 m. Take Chezy's Constant as 60 and the slope of the bed as 1 in 2000.

(7 marks)

- III. A (i) Derive the dynamic equation for gradually varied flow, stating the assumptions used.

(8 marks)

- (ii) What is back water curve ? Explain the method to compute it.

(7 marks)

Or

Turn over

- B (i) Explain the methods of stream flow measurement. (7 marks)
- (ii) A river 48 m. wide has a normal depth of flow of water at 3.1m. The bed slope is 1 in 900. A weir built across the river raises the water level to 5.1 m at the weir site above the bottom of the river.

Taking the value of Manning's N as 0.02, calculate the approximate length of back water curve.

(8 marks)

- IV. A (i) The discharge of water through a rectangular channel of bed width, 9 m. is 18 m. cumec and the depth of flow is 1.2 m. Calculate critical depth, critical velocity, specific energy and minimum specific energy.

(8 marks)

- (ii) Derive the expression for the energy loss in a hydraulic jump. (7 marks)

Or

- B (i) A sluice gate discharges water into a horizontal rectangular channel with a velocity of 12 m/s at a depth of 1.2 m. Will there be a hydraulic jump. If it occurs, calculate the depth after the jump and the loss in energy.

(8 marks)

- (ii) Describe the types of IS stilling basins and their choice. (7 marks)

- V. A (i) A jet of water having a velocity of 20 m/s strikes a curved vane, which is moving with a velocity of 5 m/s. The jet makes an angle of 30° with the direction of motion of vane at inlet and leaves at an angle of 120° to the direction of motion of vane at outlet. Calculate : (i) Vane angles, if the water enters and leaves the vane without shock ; and (ii) Work done per second per unit weigh of water striking the vanes per second.

(8 marks)

- (ii) Describe the operating characteristics of a centrifugal pump. (7 marks)

Or

- B (i) Define the specific speed of a turbine.

What is meant by Cavitation in hydraulic machines and its effects ? (7 marks)

- (ii) A single-acting reciprocating pump has a plunger of 100 mm. diameter and a stroke length 200 mm. The centre of the pump is 3 m. above the water level in the sump and 20m below the water level in a tank to which water is delivered by the pump. The diameter and length of suction pipe are 50 mm. and 5 m. while of the delivery pipe are 40 mm. and 30m respectively. Determine the maximum speed at which the pump may be run without separation, if separation occurs at 7.5 m. below the atmospheric pressure. Take atmospheric pressure head = 10.3m of water.

(8 marks)

[4 × 15 = 60 marks]