3/15 FN

Reg. No. | | | | | | | | | | | | |

Question Paper Code : 51250

B.E/B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016

Fourth Semester

Civil Engineering

CE 2253/CE 44/CE 1253 A/10111 CE 404/080100020 – APPLIED HYDRAULICS ENGINEERING

(Regulations 2008/2010)

(Common to PTCE 2253 – Applied Hydraulics Engineering for B.E. (Part-time) Fourth Semester – Civil Engineering – Regulations 2009)

Time : Three Hours **Maximum : 100 Marks**

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. What is a prismatic channel ?
2. Draw a neat sketch of the velocity distribution in trapezoidal channel.
3. Write the Bazin's formula for the discharge in the canal.
4. Define uniform and non-uniform flow in channels.
5. Define transition depth.
6. Define energy dissipation.
7. Define the term negative slip.
8. Define the term indicator diagram.
9. How would you classify turbines based on the direction of flow in the runner ?
10. Draw typical velocity triangles for inlet and outlet of Pelton Wheel.

PART – B (5 × 16 = 80 Marks)

11. (a) (i) A 3 m wide rectangular channel conveys 12 m^3/s of water at a depth of 2 m. Calculate

(1) Specific energy of flowing fluid.

(2) Critical depth, critical velocity and the minimum specific energy.

(3) Froude number and state whether flow is subcritical or supercritical. **(10)**

(ii) What do you understand by critical depth of an open channel when the flow in it is not uniform ? **(6)**

OR

(b) (i) Calculate the specific energy of 12 m^3/s of water flowing with a velocity of 1.5 m/s in a rectangular channel 7.5 m wide. Find the depth of water in the channel when the specific energy would be minimum. What would be the value of critical velocity as well as minimum specific energy ? **(10)**

(ii) Derive an expression for critical depth and critical velocity. **(6)**

12. (a) A trapezoidal channel with side slopes 1 : 1 has to be designed to convey 15 m^3/sec at a velocity of 3 m/sec so that the amount of concrete lining for the bed and sides is the minimum. Calculate the area of lining required for one metre length of channel. **(16)**

OR

(b) (i) How the stream discharge is measured by chemical method ? Explain. **(8)**

(ii) Derive Chezy's formula to determine the velocity of flow in open channel. **(8)**

13. (a) (i) What are the assumptions made in the analysis of Gradually varied flow ? **(6)**

(ii) The bed width of a rectangular channel is 24 m and the depth of flow is 6 m. The discharge in the canal is 86 cumecs. The bed slope of the channel is 1 in 4000. Assume Chezy's constant C = 60. Determine the slope of the free water surface. **(10)**

OR

(b) (i) What are the conditions for the formation of hydraulic jump ? **(4)**

(ii) In a rectangular channel of bed width 0.5 m, a hydraulic jump occurs at a point where depth of flow is 0.15 m and Froude's Number is 2.5. Determine (1) The Specific Energy (2) The critical depth (3) The subsequent depths (4) Loss of head (5) Energy Dissipated. **(12)**

14. (a) A centrifugal pump having outer diameter equal to two times the inner diameter and running at 1000 r.p.m. works against a total head of 40 m. The velocity of flow through the impeller is constant and equal to 2.5 m/s. The vane are set back at an angle of 40° at outlet. If the outer diameter of the impeller is 500 mm and width at outlet is 50 mm.

Determine :

(i) Vane angle at inlet

(ii) Work done by impeller on water per second, and

(iii) Manometric efficiency **(16)**

OR

(b) Draw the ideal indicator diagram and include the acceleration head and frictional head during the different strokes. And also write down the total work done during the suction stroke and the middle of the delivery stroke. **(16)**

15. (a) A Kaplan turbine runner is to be designed to develop 9100 kW. The net available head is 5.6 m. If the speed ratio = 2.09, flow ratio = 0.65, overall efficiency 86% and the diameter of the base is 1/3 the diameter of the runner. Find the diameter of the runner, its speed and the specific speed of the turbine. **(16)**

OR

(b) A Pelton wheel is required to develop 8575 kW when working under the head of 250 m. The speed of the Pelton wheel is 500 rpm. The co-efficient of velocity is 0.98 and the speed ratio is 0.46. Assuming jet ratio as 10 and overall efficiency as 82%. Determine :

(i) The number of jets **(6)**

(ii) The diameter of the wheel **(6)**

(iii) The quantity of water required **(4)**
