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

Question Paper Code : 40784

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2018
Fourth Semester
Civil Engineering
CE 6403 – APPLIED HYDRAULIC ENGINEERING
(Regulations 2013)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions.

PART – A **(10×2=20 Marks)**

1. Define sub-critical, critical and super critical flow.
2. Define uniform flow. Give examples.
3. Distinguish between drawdown and backwater curves.
4. Define Afflux.
5. State the uses of hydraulic jump.
6. Define transition depth.
7. What are the types of characteristic curves ?
8. What is the purpose of providing a casing in turbine ?
9. What is an indicator diagram ?
10. Define rotary pumps.

PART – B **(5×13=65 Marks)**

11. a) Derive the Chezy's formula for discharge through channel. Write the formulae to find out the constant C.

(OR)

b) A rectangular channel carries a water flow of 20 m^3/s and has n = 0.014 and bed width as 6.5 m. Find the following :

i) Critical depth.

ii) Minimum specific energy.

iii) Depth of flow for specific energy of 3.5 m.

iv) What is the type of flow if the depths of flow are 2 m and 1.5 m ?

12. a) Explain the features of water surface flow profile classifications.

(OR)

b) Explain the direct step method and standard step method of obtaining numerical solution to GVF problems.

13. a) At the bottom of a spillway the velocity and depth of flow are 12 m/s and 1.5 m respectively. If the tail water depth is 5.5 m find the location of the jump with respect to the toe of the spillway. What should be the length of the apron to contain this jump ? Assume the apron to be horizontal and Manning's n = 0.015.

(OR)

b) Define surges. What are its types ? How the energy dissipated ? Explain in detail.

14. a) A Kaplan turbine runner is to be designed to develop 8500 kW. The net available head is 4.9 m. If the speed ratio = 2.12, flow ratio = 0.60, overall efficiency 82% and the diameter of the boss is 1/3 the diameter of the runner. Find the diameter of the runner its speed and the specific speed of the turbine.

(OR)

b) i) Explain in detail about the main parts of Pelton wheel turbine. **(8)**

ii) A Pelton wheel is having a mean bucket diameter of 1.2 m and is running at 1100 rpm. The net head on the Pelton wheel is 850 m. If the side clearance angle is 15° and discharge through nozzle is 0.1 m^3/s, find : a) power available at the nozzle and b) hydraulic efficiency of the turbine. **(8)**

15. a) A centrifugal pump has a suction lift of 1.5 m and the delivery tank is 13.5 m above the pump. The velocity of water in the delivery pipe is 1.5 m/s. The radial velocity of flow through the wheel is 3 m/s and the tangent to the vane at exit from the wheel makes an angle of 120° with the direction of motion. Assuming that the water enters radially and neglecting friction and other losses, determine :

i) Velocity of wheel at exit.

ii) Velocity and pressure head at exit from the wheel and

iii) Direction of fixed guide vanes.

(OR)

b) i) A single acting reciprocating pump has a plunger diameter of 200 mm and stroke length of 320 mm. The speed of the pump is 50 rpm and the discharge is 0.035 cumecs of water. Determine : i) the theoretical discharge, ii) coefficient of discharge, iii) percentage of slip.

ii) Explain in detail about the working of air vessel.

PART – C **(1×15=15 Marks)**

16. a) Explain with a neat sketch, the construction details and working principles of a centrifugal pump.

(OR)

b) What are characteristic curves in turbines ? List the types. Explain in detail with neat sketches.