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

Question Paper Code: 1034312

B.E. / B.Tech. DEGREE EXAMINATIONS, NOV / DEC 2024
Fourth Semester
Civil Engineering
U20CE403 – HYDRAULICS AND HYDRAULIC MACHINERY
(Regulation 2020)

Time: Three Hours | Maximum: 100 Marks

Answer ALL questions

PART – A (10 x 2 = 20 Marks)

1. Distinguish between a pipe flow and an open channel flow.
2. Show the velocity distribution diagram in a trapezoidal channel.
3. Define uniform flow.
4. Tell about the critical flow.
5. Compare the draw down and back water curves.
6. Name the different types of hydraulic jump.
7. Distinguish between Impulse and Reaction turbine.
8. Recall the term draft tube.
9. What are the main components of a centrifugal pump?
10. Tell about the indicator diagram.

PART – B (5 x 16 = 80 Marks)

11. (a) Illustrate the types of flow in channels. (16)

(OR)

(b) A trapezoidal channel has side slopes of 3 horizontal to 4 vertical and slope of its bed is 1 in 2000. Determine the optimum dimensions of the channel, if it is to carry water at 0.5 m^3/s. Take chezy's constant 80. (16)

12. (a) Draw a specific energy curve and obtain a condition for critical depth. (16)

(OR)

(b) The discharge of water through a rectangular channel of width 8m, is 15 m^3/s when depth of flow of water is 1.2 m. Calculate: (16)
(i) Specific energy of the flowing water
(ii) Critical depth and critical velocity
(iii) Value of minimum specific energy
(iv) Derive the Froude number.

13. (a) Develop the dynamic equations of gradually varied flow. (16)

(OR)

(b) Determine the length of the back water curve caused by an affux of 2.0 m in a rectangular channel of width 40m and depth h_1= 2.5m. The slope of the bed is given as 1 in 11000. Take Manning's N = 0.03. (16)

14. (a) The following data refer to an inward flow reaction turbine: External and internal diameters = 1.2 m and 0.6 m. Velocity of flow is constant and equal to 2.5 m/s; Head = 22 m ; Guide blade angle = 10^o. The vanes are radial at inlet. Assume that the discharge at outlet is also radial. Compute the (16)
(i) Speed of turbine
(ii) Vane angle at outlet and
(iii) Hydraulic Efficiency

(OR)

(b) 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 = 0.68, Overall efficiency = 86 % and the diameter of the boss is 1/3 the diameter of the runner. Calculate the diameter of the runner, its speed and the specific speed of the turbine. (16)

15. (a) A centrifugal pump with 1.2 m outer diameter of impeller and inner diameter of impeller being 0.6m. Runs at 200 r.p.m and pumps 1880 lps with an average lift of 6 m. Angle of vanes at exit with the tangent to the impeller is 26^0 and the radial velocity of flow is 2.5 m/s. Calculate the manometric efficiency and the least speed to start the pump. (16)

(OR)

(b) A double acting reciprocating pump has an air vessel fitted on the suction pipe. The plunger is 150 mm diameter and 300 mm long. The suction pipe is 8 m long and 150 mm diameter. Determine the rate of flow into the cylinder from the air vessel at crank positions of 30^o, 90^o and 120^o from the inner dead centre. Take Speed of the pump as 120 rpm. (16)

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