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Question Paper Code : X 60249

B.E./B.Tech. DEGREE EXAMINATIONS, NOV./DEC. 2020

Fourth Semester

Civil Engineering

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

(Regulations 2008/2010)

(Common to PTCE 2253/10111 CE 404 – Applied Hydraulics Engineering for B.E. (Part-Time) Fourth semester – Civil Engineering – Regulations 2009/2010)

Time : Three Hours Maximum : 100 Marks

Answer ALL questions.

PART – A **(10×2=20 Marks)**

1. Differentiate between steady flow and uniform flow in an open channel.
2. Define specific energy.
3. Write the empirical relation for Manning's formula with expansion.
4. What is meant by best section ?
5. Write down the dynamic equation of Gradually Varied Flow.
6. Distinguish between positive and negative surges.
7. Define negative slip.
8. Write a short notes on Indicator diagram.
9. What is priming in a centrifugal pump ?
10. Write the classification of turbines based on specific speed.

PART – B **(5×16=80 Marks)**

11. a) Explain with neat sketches about different types of open channel flow. **(16)**

(OR)

b) Water flows at rate of 20 cumecs in a rectangular channel 14 m wide at a velocity of 1.8 m/s. Determine the specific energy of the flowing water, critical velocity and minimum specific energy corresponding to this discharge, the Froude number and state whether the flow is subcritical or supercritical. **(16)**

12. a) Show that the hydraulic radius is half the flow depth for the most economic trapezoidal channel section. **(16)**

(OR)

b) Find the rate of flow of water through a V-shaped channel with depth of flow 5 m and having angle of 30°. Take the value of Bazin's constant m = 0.21 and slope of the bed as 1 in 2500.

13. a) i) Differentiate the 'Gradually varied flow' and 'Rapidly varied flow'. **(4)**

ii) Define the terms : (1) Afflux and (2) Back water curve. Derive an expression for the length of the back water curve. **(12)**

(OR)

b) A venturiflume is 1.30 m wide at entrance and 0.65 m in the throat. Neglecting hydraulic losses in the flume, calculate the flow if the depths at the entrance and throat are 0.65 m and 0.60 m respectively. A hump is now installed at the throat, of height 200 mm, so that a standing wave (hydraulic jump) is formed beyond the throat. What is the increase in the upstream depth when the same flow as before passes through the flume ? **(16)**

14. a) Illustrate with neat diagram the working principle and parts of the centrifugal pump.

(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 :

1) The theoretical discharge,

2) Co-efficient of discharge,

3) Percentage of slip. **(8)**

ii) Explain in detail about the working of air vessel. **(8)**

15. a) i) Distinguish between impulse and reaction turbines. **(6)**

ii) A Pelton Wheel is required to develop 8825 kW when working under the head of 300 m. The speed of the pelton wheel is 540 r.p.m. The coefficient of velocity is 0.98 and the speed ratio is 0.46. Assuming jet ratio as 10 and overall efficiency as 84%, determine :

1) The number of jets

2) The diameter of the wheel

3) The quantity of water required. **(10)**

(OR)

b) i) What are the various types of draft tube ? **(4)**

ii) A Francis Turbine is to be designed to develop 360 kW under a head of 70 m and a speed of 750 r.p.m. The ratio of width of runner to diameter of runner 'n' is 0.1. The inner diameter of the runner is half the outer diameter. The flow ratio is 0.15. The hydraulic efficiency is 95% and the mechanical efficiency is 84%. Four percent of the circumferential area of runner is to be occupied by the thickness of the vanes. The velocity of flow is constant and the discharge is radial at exit.

Determine :

1) The diameter of the wheel

2) The quantity of water supplied

3) The guide vane angle at inlet and

4) Runner vane angles at inlet and exit. **(12)**
