KUMARAGURU
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Register Number: ……..

B.E DEGREE EXAMINATIONS: MAY 2015

(Regulation 2009)

Fourth Semester

CIVIL ENGINEERING

CEE108**:** Applied Hydraulics And Hydraulic Machinery

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

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Steady flow in an open channel exists when the
   a) Flow is non-uniform
   b) Depth of flow does not change with time
   c) Channel is frictionless
   d) Channel bed has a mild slop
2. The discharge through a trapezoidal channel is maximum when
   a) m=d/3
   b) m=d/2
   c) m=2d
   d) m=3d/2
3. The most economical section of a rectangular channel is obtained when the ratio of width “B” to depth “h” is
   a) 2
   b) 1
   c) 1/2
   d) 2/3
4. The depth of flow at which specific energy is minimum is called
   a) Normal depth
   b) Alternate depth
   c) Critical depth
   d) Sequent depth
5. Loss of energy due to the formation of hydraulic jump is equal to
   a) $(d_2-d_1)^3 / 4(d_1d_2)$
   b) $(d_1-d_2)^3 / 4(d_1d_2)$
   c) $4(d_1d_2) / (d_2-d_1)^3$
   d) $4(d_1d_2) / (d_1-d_2)^3$
6. Waves in open channels propagate with velocity equal to
   a) $\sqrt{2gy}$
   b) $\sqrt{gy}$
   c) $\sqrt{gy+V}$
   d) $\sqrt{y}+\sqrt{E/\rho}$
7. In a Kaplan turbine, the discharge through the turbine
   a) Remains constant with increase in speed
   b) Increases with increase in speed

c) Decreases with increase in speed d) is always constant

8. Pelton wheel Turbines is an example for _____ Turbines

a) an impulse flow b) an axial flow

c) a radial flow impulse d) a radial flow reaction

9. An air vessel used in a reciprocating pump is filled with

a) atmospheric air b) compressed air

c) compressed water d) any compressed liquid

10. The work saved by fitting an air vessel to a single acting reciprocating pump is

a) 39.2% b) 84.8%

c) 48.8% d) 92.3%

PART B (10 x 2 = 20 Marks)

11. Differentiate between ; uniform flow and non-uniform flow
12. Write the different types of regimes of flow
13. What do you mean by the the term 'specific Energy'
14. State the practical applications of hydraulic jump.
15. Define the term 'Surge'.
16. List any four assumptions made for the equation of gradually varied flow?
17. Give any two examples for the reaction turbine.
18. List out the uses of a draft tube.
19. Differentiate between ; A Single acting & Double acting Reciprocating Pump
20. Write the principle of working of a centrifugal pump

PART C (5 x 14 = 70 Marks)

21. a) 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 $0.5m^3/s$. Take Chezy's constant as 80.

(OR)

b) An open channel is to be designed to carry 10 m^3/s at a slope of 0.0065. Assuming that Mannings roughness coefficient is 0.011, determine the most efficient (i) rectangular and (ii) trapezoidal sections for the channel.

22. a) Find the critical depth and critical velocity of the water flowing through a

rectangular channel of width 4.5m, when discharge is 14m^3/s. Also find the value of the minimum specific energy.

(OR)

b) Define specific energy curve? Draw the specific energy curve, and then derive expressions for the critical depth and critical velocity

23. a) Derive an expression for the depth of hydraulic jump in terms of the upstream Froude number

(OR)

b) The depth of flow of water, at a certain section of a rectangular channel of 2m wide, is 0.3m. The discharge through the channel is 1.5m^3/s. Determine whether a hydraulic jump will occur, and if so, find its height and loss of energy per kg of water.

24. a) Design a Pelton wheel turbine for a head of 60m when running at 200 rpm. The Pelton wheel develops 95.525kW shaft power. The velocity of the buckets is 0.45 times the velocity of the jet, overall efficiency is 0.85 and coefficient of the velocity is equal to 0.98.

(OR)

b) A Kaplan turbine develops 24647.6 kW power at an average head of 39m. Assuming a speed ratio of 2, flow ratio of 0.65, diameter of the boss equal to 0.35 times the diameter of the runner and an overall efficiency of 86%, Calculate the diameter, speed and specific speed of the turbine.

25. a) A centrifugal pump delivers water against a net head of 14.5metres and a design speed of 1000 r.p.m. The vanes are curved back to an angle of 30° with the periphery. The impeller diameter is 300mm and outlet width 50mm. Determine the discharge of the pump if manometric efficiency is 95%.

(OR)

b) i) State the uses of reciprocating pump and describe the principle and working of reciprocating pump with neat sketches (7)

ii) Why the reciprocating pump not coupled directly to the motor? Discuss the reason in detail. (7)

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