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**Reg. No. :**

**Question Paper Code: 44015**

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2017

Fourth Semester

Civil Engineering

14UCE405- APPLIED HYDRAULIC ENGINEERING

(Regulation 2014)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. The thickness of boundary layer at the leading edge will be

(a) Maximum (b) Minimum (c) Zero (d) Average

2. While using Darcy-Weisbach equation for estimating head loss in a pipe flow, the

friction factor was misjudged by +20% then, the error in estimating discharge is

(a) +10% (b) +40% (c) -40% (d) -10%

3. A rectangular channel section will be most economical when the depth of flow and

bottom width are in the ratio of

(a) 1:4 (b) 1:1 (c) 1:2 (d) 2:1

4. In an open channel flow the discharge corresponding to the critical depth is

(a) Maximum (b) Minimum (c) Zero (d) Average

5. Which of the following is the correct representation of the sequence of surface profiles if

the channel slope changes from mild to steep?

(a) M1,S1 (b) M3, S2  (c) M2,S3 (d) M2,S2

6. In gradually varied flow, if dy/dx is positive then dE/dx will be

(a) Always zero (b) Positive if y > yc

(c) Negative if y > yc  (d) Always negative

7. Cavitation in turbine causes

(a) Damage to blades (b) Noise and vibrations

(c) Fall in efficiency (d) All of the above

8. The specific speed of a Francis turbine is in the range of

(a) 10 to 35 (b) 35 to 60 (c) 60 to 140 (d) 3000 to 1200

9. The valve provided in a suction pipe is called

(a) Float valve (b) Gate valve (c) Foot valve (d) Two-way valve

10. The component of a centrifugal pump which converts the mechanical energy in to

hydraulic energy is

(a) Impeller (b) Casing (c) Runner (d) None of the above

PART - B (5 x 2 = 10 Marks)

11. Distinguish between the pipes in series and in parallel.

12. What is the purpose of providing bed slope in channel?

13. State the assumptions involved in the analysis of gradually varied flow.

14. What are the functions of draft tube?

15. Define Slip.

PART - C (5 x 16 = 80 Marks)

16. (a) Find the displacement thickness, momentum thickness, energy thickness and

Shape factor for the velocity distribution in the boundary layer given by

u/U=2(y/δ)-(y/δ)2 (16)

Or

(b) The difference in water surface levels in two tanks, which are connected by three

pipes in series of lengths 300m, 170m and 210m and of diameters 300mm, 200mm

and 400mm respectively, is 12m. Determine the rate of flow of water if co-efficient

of friction are .005, .0052 and .0048 respectively, considering (i) minor loss (ii)

neglecting minor loss. (16)

17. (a) A trapezoidal channel has side slopes of 3 horizontal to 4 vertical and the slope of

the bed is 1 in 2000. Determine the optimum dimensions of the channel, if it is to

carry water at 0.4m 3 /sec. Take the value of C as 60. (16)

Or

(b) Water flows at rate of 20cumecs in a rectangular channel 14m wide at a velocity of

1.8m/s. Determine (a) the specific energy of the flowing water, (b)critical velocity

and minimum specific energy corresponding to this discharge, (c) the Froude

number and state whether the flow is subcritical or super critical. (16)

18. (a) State and discuss the assumptions made in the derivation of the dynamic equation for

GVF. Starting from first principle, derive equation for the slope of the water surface

in GVF with respect to (i) Channel bed, (ii) Horizontal.(16)

Or

(b) (i) Derive an expression for the length of the backwater. (8)

(ii) Define Hydraulic Jump. Explain its types with neat sketches. (8)

19. (a) (i) A Kaplan turbine is to be designed to develop 9000 kW. The net available head is

5.6m. The speed ratio is 2.09 and the flow ratio is 0.68. The overall Efficiency is

86% and the diameter of the boss is one-third the diameter of the runner.

Determine the diameter of the runner, speed and specific speed of the turbine.

(8)

(ii) What are the main components of Kaplan turbine? Explain with a neat

sketches. (8)

Or

(b) An impulse wheel has a mean bucket speed of 10m/s with a jet of water flowing at the rate of 10 m3/sec under a head of 50m. The bucket deflects the jet through an angle of 165°. Calculate the work done, power given by water to the runner and the hydraulic efficiency of the turbine. Assume Coefficient of velocity as 0.99. (16)

20. (a) A single acting reciprocating pump discharges 4.5 liters per second with cylinder

bore diameter 200mm and stroke length 300mm. The pump runs at 350rpm and lifts

water through a height of 25m. The delivery pipe is 30m long and 100 mm in

diameter. Find the theoretical discharge and the theoretical power required to run the

pump. Also determine the percentage slip. (16)

Or

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

(16)