

B.Tech II Year II Semester (R13) Supplementary Examinations May/June 2017

HYDRAULICS & HYDRAULIC MACHINERY

(Civil Engineering)

Time: 3 hours

Max. Marks: 70

PART - A

(Compulsory Question)

- 1 Answer the following: (10 X 02 = 20 Marks)
- What do you understand by 'uniform and non-uniform flow' in the case of channels?
 - Define specific energy.
 - What are the conditions of 'mild slope' of a channel bottom?
 - Define hydraulic jump.
 - Draw the neat sketch of force exerted by fluid jet on moving flat plate normal to the jet.
 - Define overall efficiency of the turbine.
 - What is the purpose of draft tube in the turbine?
 - Define specific speed of a pump.
 - Explain the term geometric similarity.
 - Define momentum thickness of a boundary layer.

PART - B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT - I

- 2 (a) Derive Chezy's formula. Find the relation between Manning's and Chezy's Constants.
 (b) A rectangular notch has a crest length 1 m; the head over the notch is 0.2 m and height of the sill above the bed level is 0.15 m. If the width of the channel is 1.2 m, calculate the discharge in cumec, taking into account the velocity of approach.

OR

- 3 (a) Show that for a rectangular channel $y_c = 2/3 E$.
 (b) Determine the most efficient channel section of a trapezoidal channel with side slopes 1 vertical to 2 horizontal, carrying a discharge of 11.25 cumec with a velocity of 0.75 m/s. What should be the bed slope of the channel? Take Manning's $n = 0.025$.

UNIT - II

- 4 (a) Derive the dynamic equation for gradually varied flow.
 (b) A rectangular channel carries a discharge of $3 \text{ m}^3/\text{s}$ per meter width. If the loss of energy in the hydraulic jump is found to be 3.2 m, determine the conjugate depths before and after the jump.

OR

- 5 (a) Write a short note on (i) types of hydraulic jump and (ii) applications of hydraulic jump.
 (b) Explain the procedure for computation of surface profiles by single step method.

UNIT - III

- 6 (a) Derive an expression for the impact of jet hitting a moving curved vane at its center.
 (b) Derive an expression for the efficiency of the system of a series of flat vanes mounted on to a wheel where the jet is impinged tangentially on to the center of the lower plate with a velocity 'V' m/s. The tangential velocity of vane is 'u' m/s. Also find the condition for the maximum efficiency.

OR

- 7 What is a turbine and give the classification in detail?

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Contd. in page 2

UNIT - IV

- 8 (a) Explain the functioning of a Francis turbine with a neat diagram.
(b) Write a short note on performance of turbine under unit quantities.

OR

- 9 (a) What it is meant by priming?
(b) The diameters of an impeller of a centrifugal pump at inlet and outlet are 30 cm and 60 cm respectively. Determine the minimum starting speed of the pump if it works against a head of 30 m.

UNIT - V

- 10 (a) What are similarity laws?
(b) What is meant by dimensional analysis? What are the uses?

OR

- 11 (a) A kite weighing 12.26 N has an effective area of 0.9 m^2 . The tension in the kite string is 32.37 N, when the string makes an angle of 45° with the horizontal, for a wind of 32 km/hr, what are the coefficients of lift and drag if the kite assumes an angle of 8° with the horizontal? Take specific weight of air as 11.801 kg/m^3 .
(b) Explain formation of boundary layer along a thin flat plate.
