TCE-401 215 Printed Pages : 5

Paper Code & Roll No. to be filled in your Answer Book

Roll No. | | | | | | | | | | |

B.Tech. (IV - Sem.)

Even Semester Examination - 2016

HYDRAULICS AND HYDRAULIC MACHINES

[Time : 3 Hours] *[Maximum Marks :100]*

Note: Attempt **All** Questions

Q 1. Attempt **any four** questions: (5x4=20)

(a) Why open channel flow problems are more difficult to analyze as compared to pipe flow Problems?

(b) Define gradually varied flow and spatially varied flow.

(c) Give the pressure distribution in case of the channels having very steep slope.

(d) Find the relation $R = 512\frac{g^3 n^6}{f^3}$, where R = hydraulic radius , n= manning's coefficient, f= darcy friction factor.

(e) A triangular channel has an open angle of 60^0 and carries a flow with a velocity of 2 m/s and depth of flow is 1.25 m. Find

(i) If the slope is sub critical or super critical.

(ii) Critical depth.

Q 2. Attempt **any four** questions: (5x4=20)

(a) What are the factors affecting the value of Manning's 'n'?

(b) Prove that for most efficient Trapezoidal channel section:

$$\frac{topwidth}{2} = length\ of\ one\ side\ slope$$

(c) Prove that for a rectangular channel:

$$\left(\frac{F1}{F2}\right)^{\frac{2}{3}} = \frac{2+F1^2}{2+F2^2}$$

The Froude number corresponding to alternate depth.

(d) A trapezoidal channel is 11.0 m wide and has a side slope 2H: 1V. The channel is lined with smooth concrete of n=0.02. Find the bottom slope necessary to carry a discharge of 50 m^3/s at a depth of 3 m.

(e) For a given specific force is minimum for given critical flow condition $\frac{Q^2}{g}=\frac{A^2}{T}$. Prove.

Q 3. Attempt **any four** questions: (5x4=20)

(a) Prove that dynamic equation for GVF is $\frac{dy}{dx}=\frac{S_b-S_f}{1-\frac{Q^2T}{gA^3}}$

(b) Find the expression the segment depth ration for sloping rectangular channel.

(c) Draw and explain the mild slope & step slope profile for G.V.F.

(d) Discuss the velocity distribution in open rectangular channel in horizontal and vertical plane.

(e) Discuss specific energy curve.

Q 4. Attempt **any two** questions: (10x2=20)

(a) Define the tractive force. Discuss the shield tractive force theory using curve.

(b) Draw the neat sketch of Centrifugal pump. Discuss the following components.

(i) Impeller

(ii) Casing

(iii) Manometric Head.

(c) A centrifugal pump discharge 0.14 m^3/s of water against a head of 12.5m, the speed of the impeller being 600 rpm. The outer and inner diameter of impeller are 500 mm and 250 mm respectively and valves are bent back 35° to the tangent at exit. If the area of flow from inlet to outlet is 0.07m^2 then calculate -

(i) valve angle at inlet

(ii) Manomtic efficiency of the pump.

Q 5. Attempt **any two**: (10x2=20)

(a) Define the specific speed of turbine. Derive an expression for specific speed. Classify the turbines on the basis of head.

(b) A Kaplan turbine develops 24647.6 KW power of average head of 39 m. assuming a speed 2, flow ratio of 0.6, diameter of boss equal to 0.35 times the diameter of runner and an overall efficiency of 90%, calculate the diameter, speed and specific speed of the turbine.

(c) A pelton wheel is to be designed for the following specifications.

Shaft Power=11,772 Kw, Head=380 m, Speed=750 rpm, overall efficiency=86%, Jet diameter not to exceed 1/6 of the wheel diameter. Determine

(i) Wheel Diameter

(ii) The number of jet required and diameter of jet. Take Kv_1=0.985, Ku_1=0.45

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