BTS(C) - V - (S) – 05 – 042 (E)

B.Tech. Degree V Semester (Special Supplementary) Examination July 2005

CE 505 (A) FLUID MECHANICS II

(2002 Admissions)

Time: 3 Hours Maximum Marks: 100

I	a)	Derive Chezy's formula for uniform flow in open channels.	(7)
	b)	Differentiate between steady flow and uniform flow.	(3)
	c)	A water drain of triangular section whose bed is laid at a slope of 0.008 has symmetrical sides sloping at 2 horizontal to 1 vertical. If it discharges 0.3m^3/sec, find the depth of flow. Take manning's coefficient, N=0.027	(10)
		OR	
II	a)	Derive the conditions for maximum discharge for a trapezoidal channel section.	(12)
	b)	A certain stretch of lined trapezoidal channel has one vertical side wall and the other side wall at 45°c to the horizontal. If it is to deliver water at 30m^3/sec with a velocity of 1m/sec., calculate the bed width and the flow depth for minimum lining area.	(8)
III	a)	What are the basic assumptions in gradually varied flow?	(4)
	b)	Draw the flow profiles in steep slope channels.	(6)
	c)	A trapezoidal channel having bottom width 6m, side slopes - 2 horizontal to 1 vertical and bottom slop 0.0016, carries a discharge of 10m^3/sec. A weir placed across the channel backs up the water to a depth of 2m. Calculate how far upstream the depth is 1.5m. Take N=0.025.	(10)
		OR	
IV	a)	Explain the direct integration method and Bresse's method to find the length of flow profiles.	(8)
	b)	Starting from first principles derive equations for the slope of the water surface in gradually varied flow with respect to (i) channel bed,. (ii) horizontal.	(5)
	c)	A rectangular channel 7.5 m wide has a uniform depth of flow of 2m and has a bed slope of 1 in 3000. If due to weir constructed at the downstream end of the channel, water surface at a section is raised by 0.75m, determine the water surface slope with respect to horizontal at this section. Assume manning's N=0.02	(7)
V	a)	what are the practical applications of a hydraulic jump.	(5)
	b)	Derive an expression for the depth after the hydraulic jump in a rectangular channel.	(6)
	c)	In a rectangular channel, the loss of energy in a hydraulic jump is 4.25m. The froude number before the jump is 7.5. Find (i) Discharge per metre width of channel (ii) The depths before and after the hydraulic jump and (iii) Percentage loss of energy due to the jump.	(9)
		OR	
VI	a)	What are the effects of different types of jump in the design of stilling basin.	(6)
	b)	Derive an equation for the celerity of a wave.	(6)
	c)	A rectangular channel 4m wide carries a discharge of 12m^3/sec at a depth of 2m. Calculate the height and velocity of a surge produced when the flow is suddenly stopped completely by the full closure of a sluice gate at the downstream end.	(8)

(Turn Over)

VII a) A jet has a direct impact on a series of flat vanes mounted over the periphery of a large wheel. Determine the force of impact and the work done per second. (10)

b) A pelton wheel has to be designed for the following data: Power to be developed = 8000 hp.
Speed = 550 rpm

Ratio of jet diameter to wheel diameter $= \frac{1}{10}$

Overall efficiency = 85%
Find the number of jets: diameter of the jet: diameter of the wheel and the quantity of water required. (10)

OR

VIII a) Derive an expression for the specific speed of a turbine. (6)

b) Explain the different types of draft tubes used in turbines. (6)

c) A Kaplan turbine produces 80000 HP under a head of 25m with an overall efficiency of 90%. Taking the value of speed ratio as 1.6, flow ratio as 0.5 and the hub diameter as 0.35 times the outer, find the diameter and speed of the turbine. (8)

IX a) Explain with neat sketches the working of a single stage centrifugal pump. (8)

b) Define static and mano metric head of a centrifugal pump. (4)

c) A centrifugal pump of the radial type delivers 5000 litres per minute against a total head of 38m, when running at a speed of 1450 rpm. If the outer diameter of the impeller is 30cm and its width at the outer periphery is 1.3 cm, find the vane angle at exit. Assume manometric efficiency as 80% (8)

OR

X a) Explain the functions of air vessels in a reciprocating pump. (6)

b) Show that the maximum inertia head in a reciprocating pump without air vessel is given by $H_a = \frac{l}{g}.\frac{A}{a}\omega^2 r$ with usual notation. (7)

c) A single acting reciprocating pump has a plunger diameter 50cm and a stroke of 40cm. If the speed of the pump is 60 rpm and coefficient of discharge is 0.97, determine the percentage slip and actual discharge of the pump. (7)

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