B 2101

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2007.

Fourth Semester

Civil Engineering

CE 238 — APPLIED HYDRAULIC ENGINEERING

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the classifications of flows?

2. Draw the typical velocity profile for an open channel.

3. Write down the equation for computation of normal depth for trapezoidal channel and circular channel.

4. Define the term steady uniform flow.

5. Define the term control sections.

6. What are the two basic assumptions involved in the analysis of Gradually Varied Flow?

7. What are the uses of surges in power canals?

8. Define specific speech.

9. What is draft tube? What are their uses?

10. Define the term negative slip of a pump.

PART B — (5 × 16 = 80 marks)

11. (a) (i) If y_1 and y_2 are alternative depths in a rectangular channel, show that $(2y_1^2y_2^2)/(y_1+y_2)=y_c^3$ and Specific Energy (E) = $(y_1^2+y_1y_2+y_2^2)/(y_1+y_2)$. (8)

(ii) Describe about the different classification of free surface flows. (8)

Or

(b) (i) Find the critical depth for a specific energy head of 1.5 m in following channels,

Rectangular channel = B = 2.5 m

Triangular channel = m = 1.5

Trapezoidal channel = B = 2 m and m = 1

Circular channel = D = 1.5 m. (8)

(ii) Obtain the value of α and β for one dimensional method of flow analysis. (8)

12. (a) (i) A trapezoidal channel is 15 m wide and has a side slope of 1.5 H : 1 V the bed slope is 0.0004. The channel is lined with smooth concrete of $n = 0.012$. Compute the mean velocity and discharge for a depth of flow 4 m. (8)

(ii) A triangular channel with an apex angle of 75° carries a flow of 1.5 m^3/s at a depth of 0.90 m. If the bed slope is 0.01, find the roughness coefficient of the channel. (8)

Or

(b) (i) Explain the differentiate about Chezy's formulae and Manning's formulae. (6)

(ii) Find the rate of flow and conveyance for a rectangular channel 7.5 m wide for uniform flow at a depth of 2.25 m. The channel is having bed slope as 1 in 1000. Take Chezy's constant C = 55 also find the state of flow. (10)

13. (a) (i) State clearly the assumptions and derive the dynamic equation for gradually varied flow. (6)

(ii) Explain the development of M, S and H profiles with neat sketches. (10)

Or

(b) A wide rectangular channel carrying a discharge of 8 m^3/s has a bottom slope of 2.5×10^{-4} and $n = 0.013$. If the channel ends in a free overall, plot the water surface profile upstream of the fall by using direct step method. (16)

14. (a) Derive the equation for sequent depth ratio and energy losses for the Hydraulic jump in a rectangular channel. (16)

Or

(b) (i) Classify and explain the different types of Jumps. (8)

(ii) Explain about positive surges. (8)

15. (a) A reaction turbine works @ 450 r.p.m. under a head of 120 m. Its diameter @ inlet is 120 cm and the flow area is 0.4 m^2. The angles made by the absolute and relative velocities @ inlet are 20° and 60° respectively with the tangential velocity. Determine

(i) The volume rate of flow

(ii) Power developed

(iii) Hydraulic efficiency

Assume whirl @ outlet to be zero. (16)

Or

(b) A three stage centrifugal pump has impellers 40 cm dia and 2 cm wide at outlet. The vanes are curved back @ the outlet 45° and reduce the circumferential area by 10%. The manometric efficiency is 90% and the overall efficiency is 80%. Determine the head generated by the pump when running at 1000 rpm delivering 50 lit/s, what should be the shaft horse power? (16)