[Total No. of Questions - 9] [Total No. of Printed Pages - 3]

May-24-0428

CE-504 (Mechanics of Fluids-II)

B.Tech. 5th (CBCS)

Time : 3 Hours **Max. Marks : 60**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt Five questions, selecting one question each from sections A, B, C and D. Section E is compulsory. Unless stated otherwise, the symbols have their usual meanings in context with the subject. Assume suitably and state, additional data required or missing, if any.

SECTION - A

1. The velocity distribution in the boundary layer is given by: $\frac{u}{U}=\frac{y}{\delta}$, where u is the velocity at a distance y from the plate and u=U at y=δ, δ being boundary layer thickness. Find: (i) The displacement thickness (ii) The momentum thickness (iii) The energy thickness (iv) The value of $\frac{\delta^*}{\theta}$. (10)

2. Explain how the laminar flow can be demonstrated with the help of Reynold's apparatus. (10)

SECTION - B

3. Water flows at a uniform depth of 2 m in a trapezoidal channel having a bottom width 6 m, side slopes 2 horizontal to 1 vertical. If it has to carry a discharge of 65 m^3/s, compute the bottom slope required to be provided. Take Manning's n=0.025. (10)

4. State the conditions under which the rectangular section of an open channel will be most economical. Derive these conditions. (10)

SECTION - C

5. A rectangular channel carries a discharge of 2 m^3/s per meter width. If the loss of energy in the hydraulic jump is found to be 2.75 m, determine the conjugate depth before and after the jump. (10)

6. A concrete lined trapezoidal irrigation canal has a bottom width of 10 m, side slopes of 1H: 1V and longitudinal bottom slope of 0.0005. If the channel is several kilometers long, what is the flow depth near the downstream end for a flow of 60 m^3/s under free fall condition? (10)

SECTION - D

7. A single acting reciprocating pump has a plunger of 80 mm diameter and a stroke of length 150 mm. It takes its supply of water from a sump 3 m below the pump through a pipe 4.5 m long and 30 mm diameter. It delivers water to a tank 12 m above the pump through a pipe 25 mm diameter and 15 m long. If separation occurs at 78.48 kN/m^2 below atmospheric pressure, find the maximum speed at which the pump may be operated without separation, assume the plunger to have simple harmonic motion. (10)

8. (a) Explain with neat sketches, the working of a single stage centrifugal pump. (5)

   (b) What is meant by 'priming of a pump'? What are the different priming arrangements employed for small and big pumping units? (5)

[P.T.O.]

SECTION - E (Compulsory)

9. (a) What factors account for the loss of energy in a laminar flow?

(b) Define momentum thickness and energy thickness.

(c) Differentiate between G.V.F and R.V.F.

(d) What is Manning's formula?

(e) What is specific energy curve?

(f) Define critical flow.

(g) What are the assumptions of gradually varying flow profile?

(h) Differentiate between turbines and pumps.

(i) What is the basic difference between single stage and multi stage pumps?

(j) Define slip, percentage slip and negative slip of a reciprocating pump. (10×2=20)