Seat No. | | | | | | |

CAI1322

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Fluid Mechanics - II
(New) (1020)

P. Pages : 3

Time : Three Hours **Max. Marks : 100**

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answersheet should be written with blue ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Solve **any two** bits from each unit.
5. Assume suitable data if necessary.
6. Figures to the right indicate full marks.
7. Use of non programmable calculator is allowed.

UNIT - I

1. a) i) Explain boundary layer separation and give methods of controlling boundary layer separation ? **6**

ii) State various thicknesses of boundary layer with formulae. **4**

b) For the velocity profile for laminar boundary layer $\frac{u}{U}=\frac{3}{2}(y/\delta)-\frac{1}{2}(y/\delta)^3$

Determine the boundary layer thickness, shear stress, drag force and coefficient of drag in terms of Reynold number. **10**

c) Find the drag force exerted by a parachute 3m diameter at sea level when the speed is 25m/sec. At what speed will the same braking force be exerted by this parachute at elevation 2km. Take CD = 1.2 which remains constant. Density of air at sea level is $1.225 kg/m^3$ and changes at the rate of $1.09 kg/m^3$ per km. **10**

UNIT - II

2. a) A pipe line 30cm in diameter and 3200m long is used to pump up 50kg per second of an oil whose density is $950 kg/m^3$ and kinematic viscosity is 2.1 stokes. The centre of pipe line at the upper end is 40m above than that at the lower end. The discharge at the upper end is atmospheric. Find the pressure at the lower end and draw the hydraulic gradient and total energy line. **10**

b) Derive Darcys weisbatch equation. 10

c) A syphon of diameter 20cm connects two reservoirs having a difference in elevation of 15m. The total length of sypton is 600m and summit is 4m above the water level in upper reservoir. If the separation takes place at 2.8m of water absolute. Find the maximum length of syphons from upper reservoir to the summit. Take f = 0.004 and atmospheric pressure = 10.3 m of water. 10

UNIT - III

3. a) Explain characteristics of surface profile and based on above characteristics explain different types of slope profile. 10

b) A rectangular channel 20m wide flows with normal depth of 2m with a bed slope of 1/6400. At a cirtain section the depth of flow is 3m. How for up stream or down stream of this section will the depth be 2.6m use step method and two steps. Take n = 0.0015. 10

c) In a rectangular channel a discharge of $2m^3/s/m$ flows with a Froude No. 6. If the hydraulic jump take place Calculate the energy lost per meter width of channel due to jump. 10

UNIT - IV

4. a) A 5cm diameter jet of water having velocity 45m/sec strikes a vane having a deflection angle of 135° and moving at a velocity of 12 m/sec in the same direction . Assume no friction compute.
   i) Forces exerted by fluid on the vane.
   ii) Absolute velocity of jet when it leaves the vane.
   iii) Power developed. 10

b) A pelton wheel is to designed for the following specification, shaft power=11772kw, Head = 380 meters speed 750 r.p.m. overall efficiency=86%. Jet diameter is not to exceed one sixth of the wheel diameter Determine.
   i) The wheel diameter.
   ii) Number of jets required.
   iii) Diameter of the jet.

   Take $KV_1 = 0.985$ and $K_{u_1} = 0.45$ 10

c) Write short notes on.
   i) Specific speed of turbine. 5
   ii) Draft tube. 5

UNIT - V

5. a) i) Define specific speed and derive expression for specific speed for centrifugal pump. **8**

   i) State various heads in centrifugal pump. **2**

   b) The diameters of an impeller of a centrifugal pump at inlet and outlet are 30cm and 60cm respectively The velocity of flow at outlet is 2.0 m/sec and vanes are set back at an angle of 45° at outlet. Determine the minimum starting speed of pump if manometric efficienty is 70%. **10**

   c) Write short notes on :

   i) Model analysis of centrifugal pump. **5**

   ii) Multistage centrifugal pump. **5**

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