

C 1247

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Name

Reg.

FOURTH SEMESTER B.TECH. (ENGINEERING) (14 SCHEME) DEGREE
EXAMINATION, APRIL 2016

CE 14 403—FLUID MECHANICS



Time : Three Hours

Maximum : 100 Marks

Part A

I. Answer any *eight* questions out of ten :

- 1 Explain the different types of fluids.
- 2 Distinguish between velocity potential function and stream function.
- 3 State the conditions that should be fulfilled for the stable equilibrium of a body.
- 4 What are the different forms of energy in a fluid ? Explain each of them.
- 5 Differentiate between free vortex and forced vortex motion.
- 6 What are minor losses and what are they due to ?
- 7 List the characteristics of laminar and turbulent flows.
- 8 Explain about Froude number and Mach number.
- 9 Discuss the phenomenon of water hammer.
- 10 Explain the significance of dimensional analysis as applied to fluid flow problems.

(8 × 5 = 40 marks)

Part B

II. Answer *all* questions :

- 11 A triangular plate of base width 2 m and height 3 m is immersed in water with plane making an angle of 60° with the free surface of water. Determine the hydrostatic pressure force and the position of centre of pressure when the apex of the triangle lies 5 m below the free water surface.

Or

- 12 Deduce the general three-dimensional equation of continuity and deduce from it the continuity equation for one-dimensional frictionless flow.
- 13 A pipe line carrying oil of specific gravity 0.87 changes in diameter from 200 mm at a position A to 500 mm at another position B which is 4 metres at a higher level. If the pressures at A and B are 1 bar and 0.6 bar respectively and the discharge is $0.2 \text{ m}^3/\text{s}$, determine the loss of head and the direction of flow.

Or

Turn over

14 A venturimeter of throat diameter 6 cm has a discharge coefficient of 0.97, and with a flow of $0.025 \text{ m}^3/\text{s}$ the pressure differential is 10 N/m^2 . Make calculations for the flow rate when an orifice of 6 cm is installed in the same pipe. The discharge coefficient for the orifice is 0.62 and the pressure differential is the same.

15 Derive Hagen Poisuille's equation.

Or

16 Three horizontal pipes each 15 cm diameter have been laid in parallel for a length of 5 km between a hydraulic power house and a factory. If a constant pressure of 5 MPa is maintained at the inlet, make calculations for the power delivered to the factory. Presume that efficiency of transmission is 95%.

17 The resistance R experienced by a partially submerged body depends upon the velocity V , length of the body L , viscosity of the fluid μ , density of the fluid ρ , and gravitational acceleration g . Obtain a dimensionless expression for R .

Or

18 Water flows through a rectangular channel 1 m wide and 0.5 m deep and then a Cipolletti weir of crest length 60 cm. If the water level in the channel is 22.5 m above the weir crest, calculate the discharge over the weir. Take C_d is 0.6 and make correction for the velocity of approach.

(4 × 15 = 60 marks)