40 x3 + 34 + 17
13.6.17

T0924 / T1017 FLUID MECHANICS II

S.E. (CIVIL) sem IV CBSGS

Q.P. Code: 16400 (181)

(CBGS)

(3 hours) Total marks: 80

N B : (1) Question no.1 is compulsory.

(2) Attempt any 3 questions out of the remaining 5 questions.

(3) Assume data wherever necessary and clearly mention the assumptions made.

(4) Draw neat figures as required.

Q1 Solve any four from the following 20

a Derive an expression for the equivalent size of the pipe to replace the pipes in series.
b Write a short note on hydraulic gradient line and total energy line.
c What do you understand by hydrodynamically rough and smooth boundaries?
d Explain the propagation of pressure waves in a compressible fluid when M>1.
e Write a short note on dashpot mechanism.

Q2 a Determine the difference in the elevations between the water surfaces in the two tanks which are connected by a horizontal pipe of diameter 300 mm and length 400 m. The rate of flow of water through the pipe is 300 lps. Consider all losses and take the value of f = .008. Draw Hydraulic Gradient Line and Total Energy Line. 10

b. A siphon of diameter 200 mm connects two reservoirs having a difference in elevation of 15 m. The total length of the siphon is 600 m and the summit is 4 m above the water level in the upper reservoir. If the separation takes place at 2.8 m of water absolute, find the maximum length of siphon from the upper reservoir to summit. Take f = .004 and atmospheric pressure = 10.3 m of water. 10

Q3 a A pipe line of 0.6 m diameter is 1.5 km long. To increase the discharge, another line of the same diameter is introduced parallel to the first in the second half of the length. Neglecting minor losses, find the increase in discharge if 4f = 0.04. The head at inlet is 300 mm. 10

b Find an expression for the diameter of nozzle for maximum transmission of power. 5

c A valve is provided at the end of a cast iron pipe of diameter 150 mm and of thickness 10 mm. The water is flowing through the pipe, which is suddenly stopped by closing the valve. Find the maximum velocity of water, when the rise of pressure due to sudden closure of valve is 196.2 N/cm^2. Take K for water as 19.62×10^4 N/cm^2 and E for cast iron pipe as 11.772×10^6 N/cm^2. 5

Q4 a State assumptions in Hardy-Cross method used for solving pipe network problems and obtain an expression for correction in discharge for value of n=2. 10

b Calculate the stagnation pressure, temperature and density on the stagnation point on the nose of a plane, which is flying at 800 km/hour through still air having a pressure 8.0 N/cm^2 (abs) and temperature -10^0C. Take R = 287 L/kg K and k= 1.4. 10

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Q5 a An oil of viscosity 0.1 Ns/m² and relative density 0.9 is flowing through a circular pipe of diameter 50 mm and of length 300 m. The rate of flow of fluid through the pipe is 3.5 litres/s. Find the pressure drop in a length of 300 m and also the shear stress at the pipe wall. 10

b Show that the momentum correction factor and energy correction factor for laminar flow through a circular pipe are 4/3 and 2.0 respectively. 10

Q6 a A smooth pipe of diameter 400 mm and length 800 m carries water at the rate of 0.04 m3/s. Determine the head lost due to friction, wall shear stress, centre line velocity and thickness of laminar sub-layer. Take the kinematic viscosity of water as 0.018 stokes. 10

b Write short notes on 10

(i) Prandtl's mixing length theory

(ii) Moody's diagram

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