Paper / Subject Code: 40406 / Fluid Mechanics -II

S.E (Sem IV) / CBCS / Civil

20 DEC 2018.

(3 Hours) (Total Marks : 80)

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

2) Attempt **any three** questions out of remaining **five** questions.

3) Assume any additional **data** if **necessary** and **state clearly**.

4) Draw **neat figures** as **required**.

Q1) Attempt **any four** of the following (20)

a) Explain the term co-efficient of friction. On what factors does this coefficient depend?

b) Define and explain the terms: Hydraulic gradient line and Total energy line.

c) What is meant by boundary layer? Why does it increase with distance from the upstream edge?

d) What do you mean by sub sonic, sonic and supersonic flows?

e) Derive Darcy-Weisbach equation

f) What is siphon? On what principle it works?

Q2a) The difference of water level of two reservoir is 6m. They are connected by 30m long pipe. For the first 20m length the diameter of the pipe is 120mm and for the remaining length the diameter is 200mm, the change in diameter being sudden. Find discharge into lower reservoir. Take f= 0.008. Draw HGL & TEL also. (10)

Q2b) Derive an expression for equivalent size of pipe in series. A piping system consists of three pipes arranged in series. The lengths of the pipes are 1000m, 800m, 300m and the diameters are 500mm, 400mm and 300mm respectively when they are connected in series. These pipes are to be replaced by a single pipe of length 2100m. Find the diameter of single pipe. (10)

Q3a) Explain what is meant by separation of boundary layer? Describe with sketch the methods to control separation. (12)

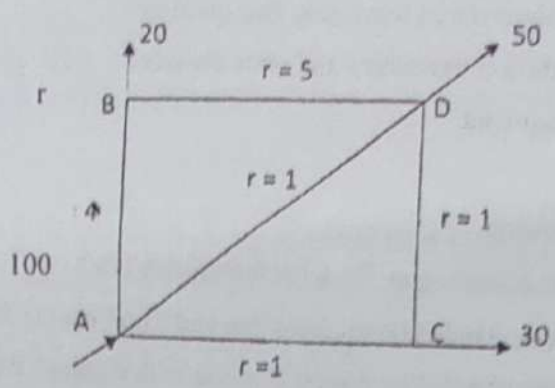
Q3b) An aeroplane travels in air of pressure of 1 bar at 10°C at a speed of 1800 km/hour. Find the Mach number and Mach angle. Take k= 1.4 & R= 287 J/Kg K. (08)

Q.4a) Explain Water hammer with control measures (06)

Q.4b) Find the velocity of a bullet fired in standard air, if the Mach angle is 30°. For standard air R= 287 J/ Kg K, t= 15°C and k= 1.4 (04)

Q.4c) A nozzle is fitted to a pipe 120mm in diameter and 250m long, with coefficient of friction as 0.01. If the available head at the nozzle is 100m. Find the diameter of the nozzle and the maximum power transmitted by a jet of water discharging freely out of a nozzle. (10)

Q5a) Calculate the discharge in each pipe of the network shown in fig below by Hardy Cross method. Take n=2. **(10)**



Q5b) Oil of specific gravity 0.82 is pumped through a horizontal pipeline 15mm in diameter and 3Km long at the rate of $0.015 m^3/s$. The pump has an efficiency of 68% requires 7.5 KW to pump the oil. (i) What is the dynamic viscosity of oil?

(ii) is the flow laminar? **(10)**

Q6) Attempt **any four** of the following **(20)**

a) Define Mach number and state its significance in compressible fluid flow.

b) Write a note on Moody's diagram.

c) Explain Prandtl's mixing length theory.

d) Explain Dashpot mechanism.

e) What are the important characteristics of laminar flow? Give examples where such a flow is encountered.

f) Write a note on Water Hammer & Control measures.

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