ce 4 sem fluid mechanics-ii dec 2015

QP Code : 5511

(3 Hours)

Max Marks :80

N.B (1) Question No.1 is compulsory
(2) Solve **any three** questions of the remaining questions .
(3) Assume suitable data if required.
(4) **Draw neat figures.**

Q 1) Answer **any Four** out of the following.

a) Derive Darcy's Weisbach equation for calculating loss of head due to friction in pipe.

b) Write a note on water hammer and control measures.

c) Define mach number and state its significance in compressible fluid flow.

d) Explain kinetic energy correction factor and momentum correction factor.

e) Differentiate between viscous and turbulent flow.

Q 2) a) A pipe 100 mm in diameter and 40 m long conveys water at a velocity of 2.50 m /s. If the central 20 m length is replaced by a 200 mm diameter pipe, find the savings in head loss.Assume that the change in section are sudden. Take co-efficient of friction as 0.01 and co-efficient of contraction C_C=0.62 — 10

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

Q 3) a) A horizontal pipe 4000 m long supplies water to a hydraulic machine through a 200 mm diameter pipe. Find the maximum power transmitted if the pressure at inlet to the pipe is 8000 kPa. Take f=0.007 — 08

b) Two reservoirs, having a difference in elevation of 15 m, are connected by a 200 mm diameter syphon. The length of the syphon is 400 m and the summit is 3 m above the water level in the upper reservoir. The length of the pipe from upper reservoir to summit is 120 m. If the co-efficient of friction is 0.005, determine discharge through siphon and pressure at the summit. Neglect minor losses. — 10

c) Crude oil of kinematic viscosity 2.25 stoke flows through a 20 cm diameter pipe ,the rate of flow being 15 lit/sec. Find the type of flow. — 02

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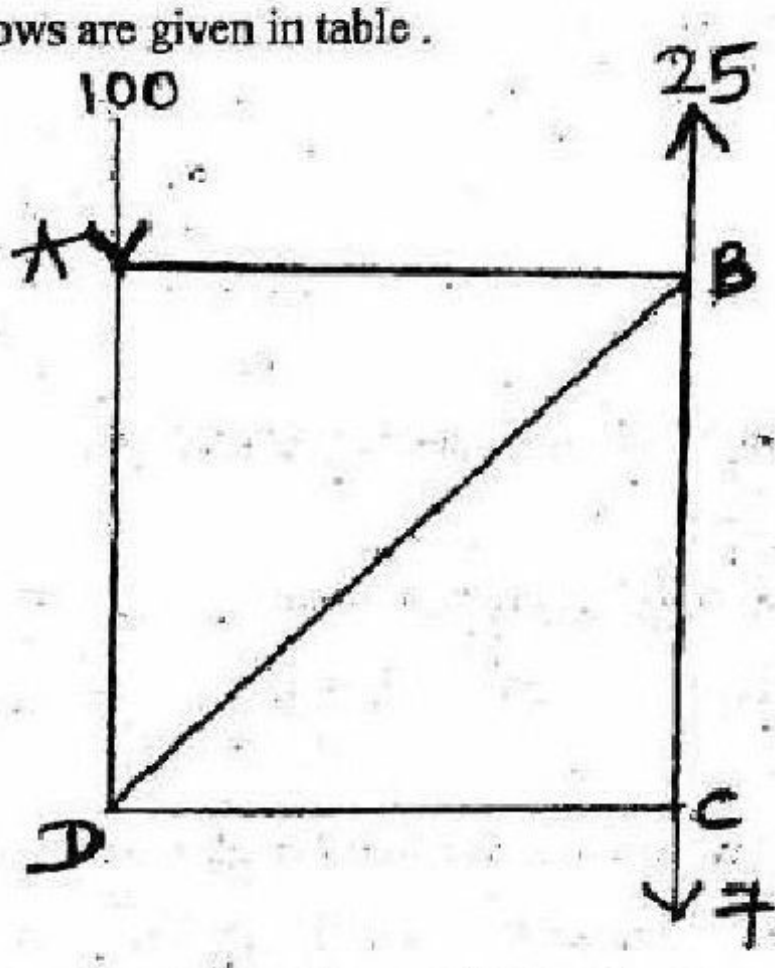
Q 4) a) Calculate the discharge distribution in the network shown below. The head loss h_f in a pipe is given by $h_f = rQ^{1.85}$. The values of r for various pipes and also the inflows or outflows are given in table. f



Pipe	AB	BC	CD	DA	BD
r value	1	2	1	2	2

b) A supersonic plane flies at 2000 km/hr at an altitude of 9 km above sea level in standard atmosphere. If the pressure and density of air at this altitude are stated to be 30 kN/m² absolute and 0.45 kg/m³, make calculations for the pressure, temperature and density at stagnation point on the nose of the plane. Take R=287 J/kg.K & $\gamma = 1.4$. 1

Q 5). a) Derive an expression for mean velocity for laminar flow between fixed parallel plates. 0

b) Oil of specific gravity 0.82 is pumped through a horizontal pipeline 150 mm in diameter and 3 km long at the rate of 0.015 m³/s. The pump has an efficiency of 68 % and requires 7.5 kW to pump the oil. (i) What is the dynamic viscosity of oil. (ii) Is the flow Laminar? 1

Q 6) a) Derive Universal Velocity distribution equation for turbulent flow. 1

b) In a pipe of diameter 300 mm the centre-line velocity and the velocity at a point 100 mm from center, as measured by pitot tube, are 2.4 m/s and 2.0 m/s respectively. Assuming the flow in the pipe to be turbulent, find : (i) Discharge through the pipe, (ii) Co-efficient of friction and (iii) Height of roughness projections 1

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