SE - Sem IV - CBSGS - Civil - FM II

163

10/06/16

QP CODE : 539400

(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. 20

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

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

c) For turbulent flow in pipes ,find the distance from the pipe at which the local velocity is equal to the average velocity .

d) Write a note on Moody's diagram.

e) Derive Area Velocity Relationship

Q 2) a) A pipeline ABC 200 m long is laid on an upward slope of 1 in 40.The length of portion AB is 100 m and its diameter is 100 mm ,while the length of portion BC is 100 m and its diameter is 200 mm .The change of diameter at B is sudden. A flow of 0.02 m^3/s is pumped into the pipe at its lower end A and is discharged at the upper end C into a closed tank. The pressure at the supply end A is 200 kN/m^2 .Find the pressure at C and draw the hydraulic gradient and total energy line .Take co-efficient of friction as 0.008. 10

b) Show that the power transmitted by a nozzle is maximum when the head lost due to friction in pipe is equal to one- third the total head supplied at the inlet of pipe 05

c) Prove that the velocity through the nozzle is given by 05

$$V = \sqrt{\frac{2gH}{1 + \frac{4fL}{D} X \frac{a^2}{A^2}}}$$

Q 3) a) Two pipes ,one of diameter 'D' and other 'd' of equal length are considered .If the pipes are connected in parallel ,the loss of head for either pipe for a flow of Q is h .If the pipes are arranged in series and the same quantity Q flows through them ,the loss of head is H .If d=0.5 D ,find the percentage of total flow through each pipe when placed in parallel and the ratio of H to h .Neglect the minor losses and assume co-efficient to be constant. 12

b) A test plane is described as having attained a flight speed of mach number equal to 2 at an attitude of 16 km where the temperature is approximately -56.5° C (216.65 K).Assuming k=1.4 & R=287 J/ kg.K, determine the speed of air plane. 02

c) Calculate the stagnation pressure 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 °C*. Take R= 287 J/kg K & k =1.4. 06

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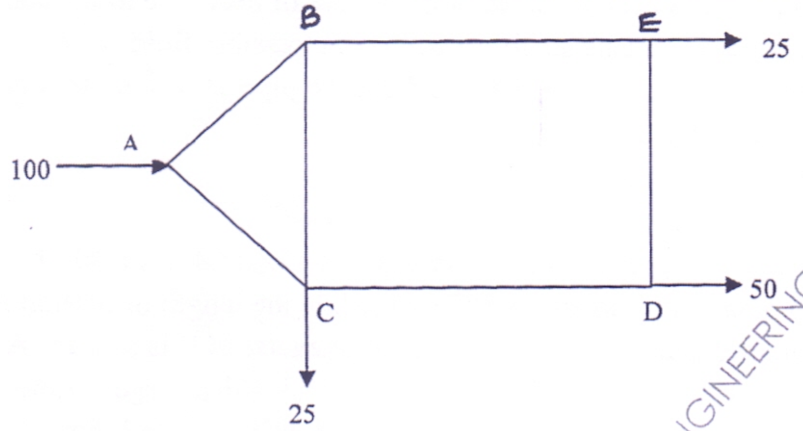
Q 4) a) For the network given below, the discharge at the nodes are known .Verify whether the suggested discharge is satisfactory , If not, adjust the distribution. An accuracy of 0.5 unit of discharge is adequate. The head loss in a pipe is given by $h_f = rQ^2$ 08

Pipe	AB	BC	DC	ED	CA	BE
r value	1	4	5	2	3	4
Discharge (units)	60	19	34	16	40	41



b) A pipeline AB 50 cm in diameter and 4500 m long ,connects two reservoirs whose constant difference of water level is 12 m . A branch pipe ,1250 m long and taken at a distance of 1500 m from reservoir A, leads to reservoir C whose water level is 15 m below that of reservoir A .Find the diameter of branch pipe ,so that the flow into both the reservoirs (B & C) is same .Assume friction factor as 0.03 for all the pipes. 12

Q 5) a) Derive an equation for Co-efficient of Viscosity in case of Dashpot mechanism. 10

b) A liquid of viscosity 0.9 poise is filled between two horizontal plates 10 mm apart. If the upper plate is moving at 1 m/s with respect to lower plate which is stationary and the pressure difference between two sections 60 m apart is 60 kN/m²,determine : 10
(i) The velocity distribution. (ii) The discharge per unit width (iii) The shear stress on the upper plate

Q 6) a) Explain Prandtl's mixing length theory. Derive expression for velocity distribution for turbulent flow in smooth pipes. 10

b) A pipeline of diameter 0.3 m carries oil at the rate of 540 lit/s. If the specific gravity of oil is 0.80 and its kinematic viscosity is equal to 0.023 stokes, determine (i) the maximum permissible height of protrusions up to which the pipe acts as smooth pipe (ii) the height of protrusions beyond which the pipe would become rough. 10

End of paper.