SE IV CIVIL CBGS
FM II

160

12.06.15

QP Code **3465**

(3 Hours) Total 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** 20

a) Derive Dupit's Equation

b) Show that the diameter of nozzle for maximum transmission of power is given by $d=\left(\frac{D^5}{8fL}\right)^{1/4}$

L=Length of the pipe and *f*- friction Co-efficient, D= Diameter of the pipe.

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

d) Derive an equation for stagnation temperature and stagnation Density.

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

f) Explain Hydro dynamically Smooth and Rough Boundaries.

Q 2) a) The difference of water level of two reservoirs is 8 m .They are connected by 40 m long pipe. For the first 25 m length the diameter of pipe is 120 mm and for the remaining length the diameter is 200 mm , the change in diameter being sudden. Find discharge into lower reservoir .Take $f = 0.008$.Draw HGL and TEL also. 10

b) The water level in the two reservoirs A and B are 104.5 m and 100 m respectively above the datum. A pipe joins each to a common point D,where pressure is 98.1 kN/m² gauge and height is 83.5 m above datum .Another pipe connects D to another tank C. What will be the height of water level in C assuming the same value of '*f*' for all pipes. 10

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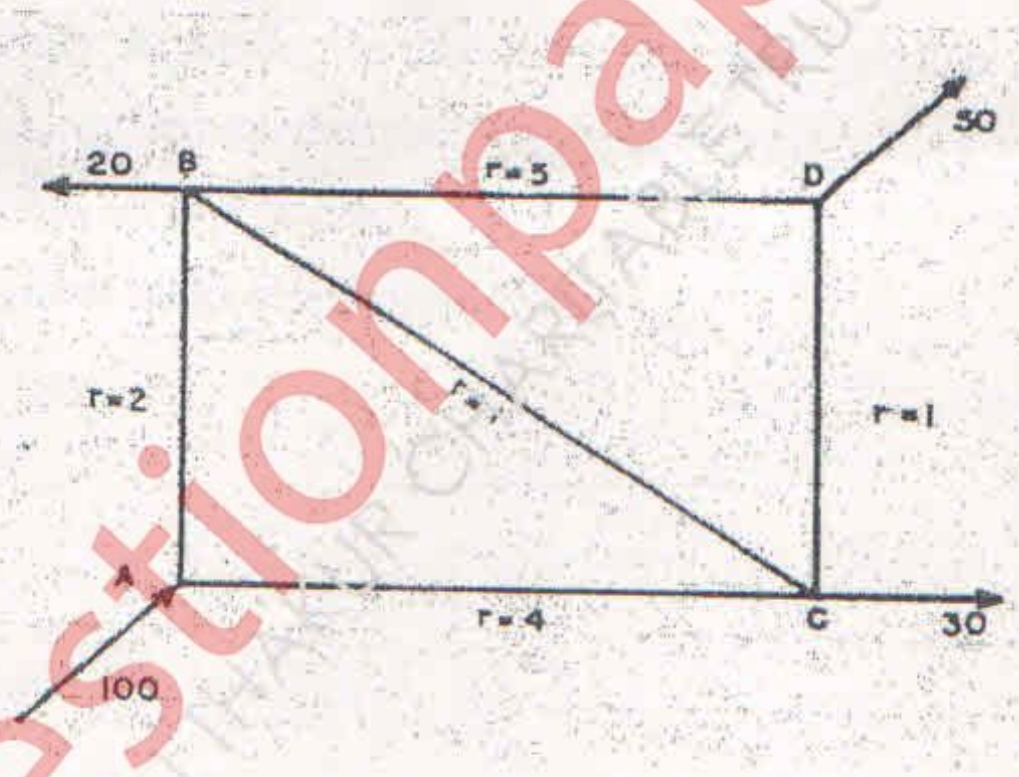
Take friction co-efficient =0.0075.The diameter of the pipes AD,BD and CD are 300 mm ,450 mm,600 mm respectively and their lengths are 240 m,270 m and 300 m respectively.

Q 3) a) Power is to be transmitted hydraulically to an accumulator at a distance of 8 km by means of number of 100 mm pipes laid horizontally for which the co-efficient of friction may be taken as 0.03.The pressure at the accumulator is maintained constant at 6524 kN/m².Determine the minimum number of pipes required to ensure an efficiency of at least 92 % ,when the power delivered is 162 kW. Also determine the maximum power that can be transmitted in this case. 10

b) Calculate the discharge in each pipe of the network shown in figure below by Hardy Cross Method .Take n=2.0 10



Q 4) a) Prove the following relationship for one dimensional compressible flow : 5

$dA/A = dV/V[M^2-1]$

b) Explain propogation of pressure waves. 5

c) Find the Mach number when an aeroplane is flying at 1100 km /hour through still air having a pressure of 7 N/cm² and temperature - 5° C .Wind velocity may be taken as zero. Take R= 287.14 J/kg K . 10

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Calculate the pressure, temperature and density of air at stagnation point on the nose of the plane Take k =1.4

Q 5) a) Derive Hagen Poiseuille law for flow of viscous fluid in circular pipes. 10

b) Two parallel plates kept 100 mm apart have laminar flow of oil between them with a maximum velocity of 1.5 m/s. Calculate: 10

(i)The discharge per meter width .(ii) The shear stress at plates.(iii) The difference in pressure between two points 20 m apart.(iv) The velocity gradient at the plates,and (v) The velocity at 20 mm from the plate. Assume viscosity of oil to be 24.5 poise.

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

b) In a pipe of diameter 300 mm the centre line velocity and the velocity at a point 100 mm from the centre ,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: 10

(i) Discharge through the pipe.

(ii) Co-efficient of Friction .

(iii) Height of roughness projections.

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