BENHA UNIVERSITY MECH. ENG. DEPT.

SHOUBRA FAC. OF ENG. 2nd YEAR, FLUID DYNAMICS

SHEET [3] 2015

**Water Hammer**

1. Explain briefly the followings:
2. Water hammer phenomena.
3. Harmful effect of water hammer.
4. Water is flowing in a pipe of 150 mm diameter D with velocity of 2.5 m/s, when it is suddenly brought to rest by closing the valve. Find the pressure rise assuming pipe is elastic, E=206 Gpa, poisson ratio 0.25 and k for water is 2.06 Gpa. Pipe wall thickness t= 5mm. expansion joints are used everywhere.
5. A pipe line of length 3 km and diameter 50 cm with water velocity 3 m/s. the pipe is made of steel with young modulus of elasticity E=2.2 Gpa. Water bulk modulus of elasticity k=2.2 Gpa and its kinematics viscosity is 10-6 m2/s. pipe wall thickness t=6 mm. the pipe is equipped with expansion joints throughout. Evaluate the speed of pressure wave C and hence find the amplitude of the pressure increase if the valve is closed in 2 Sec and 20 Sec.