

Student Name.....  
Student ID No.....  
King Saud University  
Civil Engineering Department

24/11/2008 – 26/11/1429 H  
First Mid Term Exam  
Time Allowed 1.5 hours  
Attempt all 4 questions

**Hydraulics CE-322, First Semester (1429-1430)**

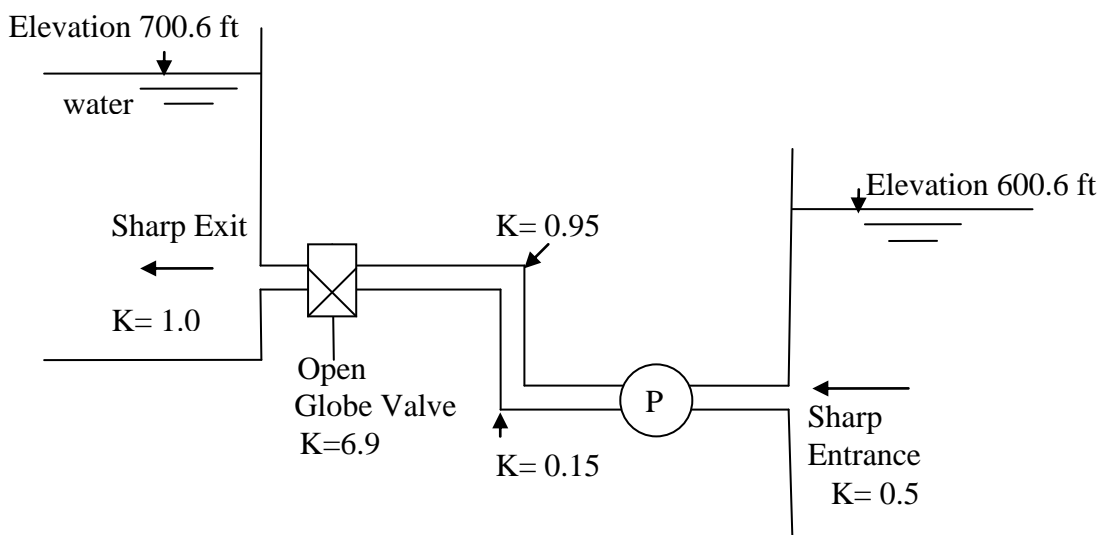
**Question (1)**

**(4 Marks)**

Water is pumped between two reservoirs at a rate of  $0.2 \text{ ft}^3/\text{s}$  through a 410 ft of 2 in diameter pipe with many minor losses as shown in the figure, If the pump (P) efficiency is 75%, calculate the brake horse power.

Take the roughness ( $\epsilon$ ) of the pipe material as  $1.66 \times 10^{-4} \text{ ft}$  and kinematic viscosity ( $\nu$ ) as  $0.000011 \text{ ft}^2 / \text{s}$ .

Sketch the HGL & TEL.

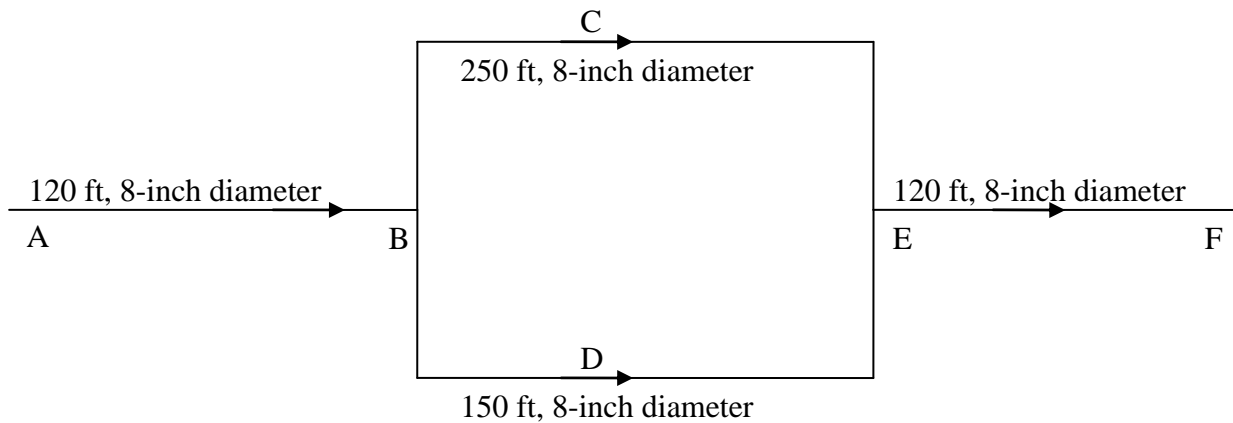


**Question (2)****(4 Marks)**

In the shown looping pipe system, determine the division of flow in pipes C & D, also find the discharge in pipe in E-F. Given that loss due to friction from A to F is 75 ft. Use the equivalent pipe method (assuming that  $h_f$  from B to E is equal to 25 ft in the calculation of the equivalent pipe length)

Use Hazen William Equation with  $C=120$  in the form:

$$Q=0.432Cd^{2.63}S^{0.54} \quad (\text{English units})$$



**Question (3)****(4 Marks)**

A RIGID steel pipeline 750 m long and 250 mm in diameter discharges  $0.15 \text{ m}^3/\text{s}$  of water ( $K=2.25 \text{ GPa}$  and  $\rho = 1000 \text{ Kg/m}^3$ ) from a reservoir to the atmosphere through a valve at the downstream end.

- (a) Calculate the transient pressure at the valve if the valve is closed in 0.9 seconds.
- (b) Calculate the transient pressure at the valve and 300 m upstream of the valve if the valve is closed in 14 seconds
- (c) How long does it take for the pressure wave to complete a full cycle.

**Question (4)**

**(3 Marks)**

1- Minor losses in pipe flow are those:

- (i) which have a small magnitude
- (ii) which are caused on account of local disturbances produced by such fittings as valves, bends etc.
- (iii) caused by friction and are thus also called friction losses
- (iv) which depend on the length of pipeline

2- The velocity head in a pipeline is equal to

- (i) The vertical distance between the datum and the pipeline
- (ii) The vertical distance between the datum and the hydraulic grade line
- (iii) The vertical distance between the hydraulic grade line and the total energy line
- (iv) The vertical distance between the datum and the total energy line

3- For pipes connected in parallel:

- (i) The friction loss is the same in all pipes
- (ii) The discharge is the same in all pipes
- (iii) Both The friction loss and the discharge are the same in all pipes
- (iv) None of the above

4- When a pump is installed on a pipeline connecting two reservoirs, the pump head " $H_p$ " is equal to:

- (i) The total head loss,  $h_L$
- (ii) The difference between the water levels of the two reservoirs,  $\Delta Z$
- (iii) Both of (i) and (ii)
- (iv) None of the above

5- The closure of Valve is considered rapid when:

- (i) The valve is closed almost instantaneously
- (ii) The duration of valve closure is less than  $2L/C$
- (iii) The duration of valve closure is less than  $L/C$
- (iv) The duration of valve closure is greater than  $2L/C$

6- Water hammer is a phenomena which is caused by:

- (i) sudden opening of a valve in a pipeline
- (ii) incompressibility of fluid
- (iii) the pipe material being elastic
- (iv) sudden closure (partial or complete) of a valve in pipeflow