

GUJARAT TECHNOLOGICAL UNIVERSITY**M. E. - SEMESTER – III • EXAMINATION – SUMMER • 2014****Subject code: 731201****Date: 03-06-2014****Subject Name: Water Supply and Drainage****Time: 02:30 pm - 05:00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Establish an equation for the correction in discharges with due sign consideration given by Hardy-Cross method. Also state the necessary conditions given. **07**
- (b) A water distribution network is an equilateral triangle in shape as ABC. If the inflow values at the junction and different K values are indicated as shown in Fig.1, find corrected discharge in each pipe. Apply two iterations only. Head loss may be assumed as $H_L = KQ^n$. Flow in the pipe is turbulent. Use Hardy-Cross method with $n = 2$. **07**
- Q.2** (a) Define the terms: (i) Intensity of rainfall, (ii) Time of concentration. Explain the rational method for the determination of storm sewage quantity flowing through a large catchment area. **07**
- (b) State the requirements of a good hydrant. **07**
- OR**
- (b) Design a sewer section for a combined system and find the diameter of a circular sewer for this system from the following data: **07**
- (i) Area to be served = 120 hectares.
 - (ii) Population of locality = 1, 00,000.
 - (iii) Maximum permissible velocity of flow = 3.2 m/s.
 - (iv) Rate of water supply = 180 lpd.
 - (v) Run off coefficient $c = 0.52$
- Assume peak discharge = 2.5 times the average discharge and 80% of water supplied is generated as waste water.
- Q.3** (a) State the points for the site selection for pumping station. **07**
- (b) Find the size of mains and BHP of the pump required for a city from the following data: **07**
- (i) Population of the city = 80,000.
 - (ii) Rate of water supply = 140 lpcd.
 - (iii) River is the source and 0.5 km away from the city.
 - (iv) The difference in the elevation between the lowest level in the sump and reservoir = 20m.
 - (v) Pump runs for 8 hours in a day.
 - (vi) Velocity of flow in the mains = 2.4 m/s
- Assume friction factor in mains = 0.02, maximum demand = 2.5 times the average demand and efficiency of pump = 75%.
- OR**
- Q.3** (a) Explain briefly the “Equivalent Pipe” method for solving large networks of pipes. Also state the two principles of hydraulics assumed for this method. **07**
- (b) Find out the corrected discharge in each pipe for a complex small pipe network as shown in Fig.2. Use equivalent pipe method. Assume any additional suitable data wherever required. Use Hazen-William nomogram. **07**
- Q.4** (a) List the different appurtenances in the distribution system and describe in detail the fire hydrants. **07**

- (b) Differentiate between the velocity meter and inferential meter. 07

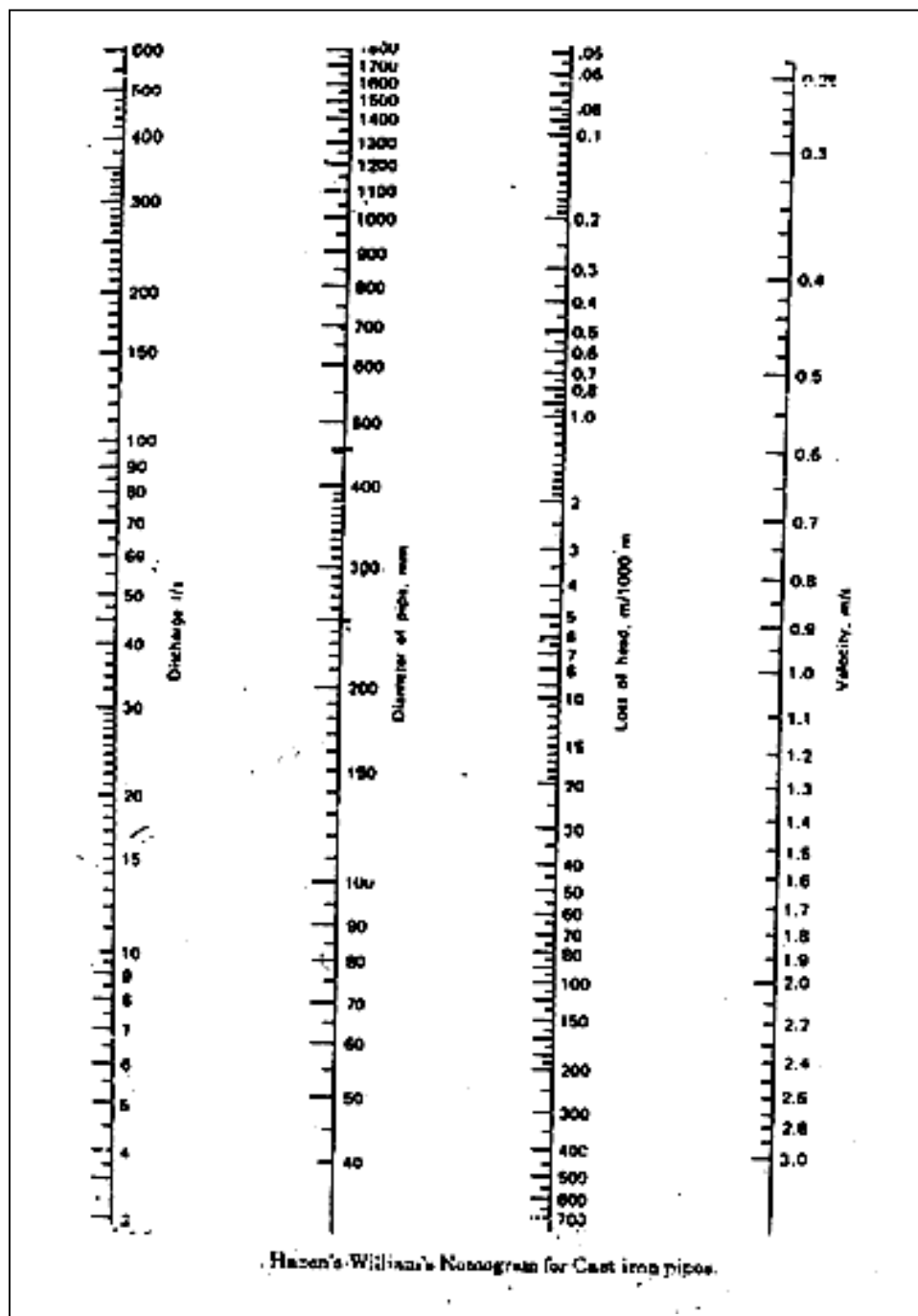
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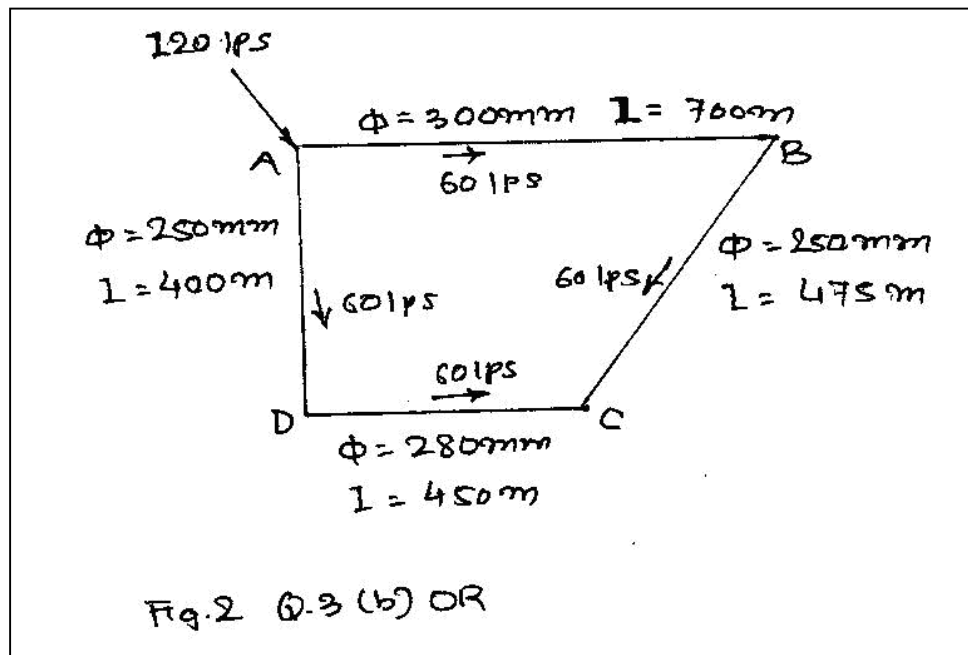
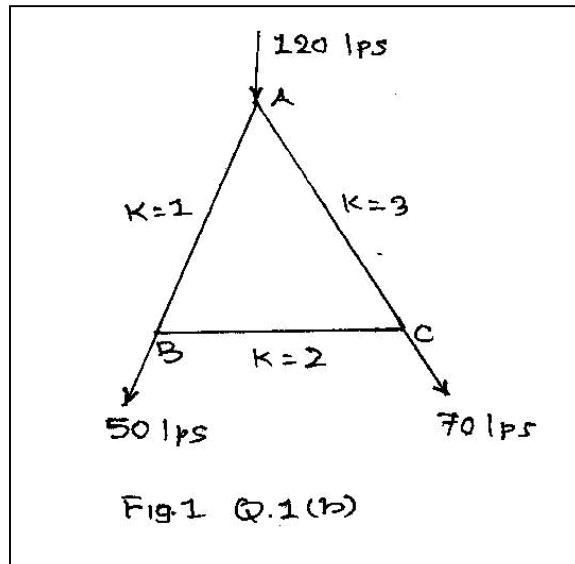
- Q.4 (a) State the general layout of a water supply project from the river source to distribution of treated water to city. How proper planning of water supply project will be ensured? 07
- (b) Explain the terms: (i) balancing storage and (ii) breakdown storage in respect of storage capacity of elevated reservoir. Draw a neat sketch of stand pipes labeling all parts. 07

- Q.5 (a) State the proportionate area and hydraulic radius relation when the sewers are running partial full. 07
- (b) Calculate the velocity of flow and corresponding discharge in a sewer of circular section having diameter = 1 m and laid at a gradient of 1 in 500. The sewer runs at 0.6 depths. Use Manning's formula with $N = 0.012$. 07

OR

- Q.5 (a) Explain specific energy curve in an open channel. 07
- (b) Compute the bottom width of a rectangular channel required to carry a discharge of $18 \text{ m}^3/\text{s}$ as a critical depth of flow with a depth of flow equal to 1.5 m. 07





Drawing is not to scale
