

MP (C) Sem - I Envt. Engg. 2615
 Hydraulics & Hydrology of water & waste water.
 BB-5586

Con. 3238-09.

(4 Hours)

[Total Marks : 100

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N.B. : (1) Question No. 1 is compulsory.

(2) Attempt any four questions out of remaining six questions.

(3) Assume suitable data where necessary stating them clearly.

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1. (a) In a 4.5 km long pipeline the flow takes place at 4.2 m/sec. The velocity of pressure wave is 1500 m/sec. Calculate, maximum pressure rise, period of oscillations and plot pressure variation at mid length of the pipe. 26/10/09

(b) Write an exhaustive note on building drainage system. MASTER 10

2. (a) Write note on pumps used for water and waste water. 8

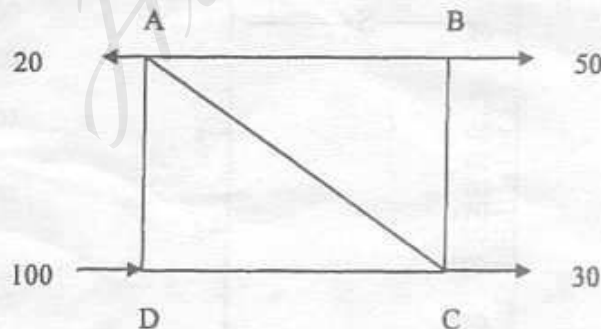
(b) The constant inflow into a balancing reservoir in a day is 3 million liters. The percentage out flow every three hours starting from 12 AM are 2, 3, 36, 13, 1, 6, 24, 15. Estimate the capacity of the balancing reservoir using graphical technique. 12

3. (a) The ordinates of a three hour unit hydrograph measured at three hour intervals starting from 0.00 in cumecs are 0, 24, 55, 125, 95, 75, 55, 35, 25, 15 and 0. Determine catchment area and ordinates of 6 hour flood hydrograph for a constant base flow of 3 cumecs. The rainfall excess for two consecutive three hour unit hydrographs are 2 cms and 3 cms respectively. 12

(b) Write an exhaustive note on design procedure of an Inverted Siphon. 8

4. (a) Explain the terms sustained flow and structural design of sewers. 8

(b) A rectangular pipe network is divided into two loops by diagonal AC as shown below. 12



For an input of 100 units at D. Find flows distribution in two trials using Hardy-Cross Method.

(Use Hazen-Williams Chart)

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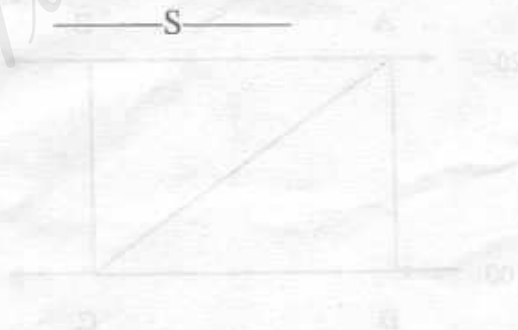
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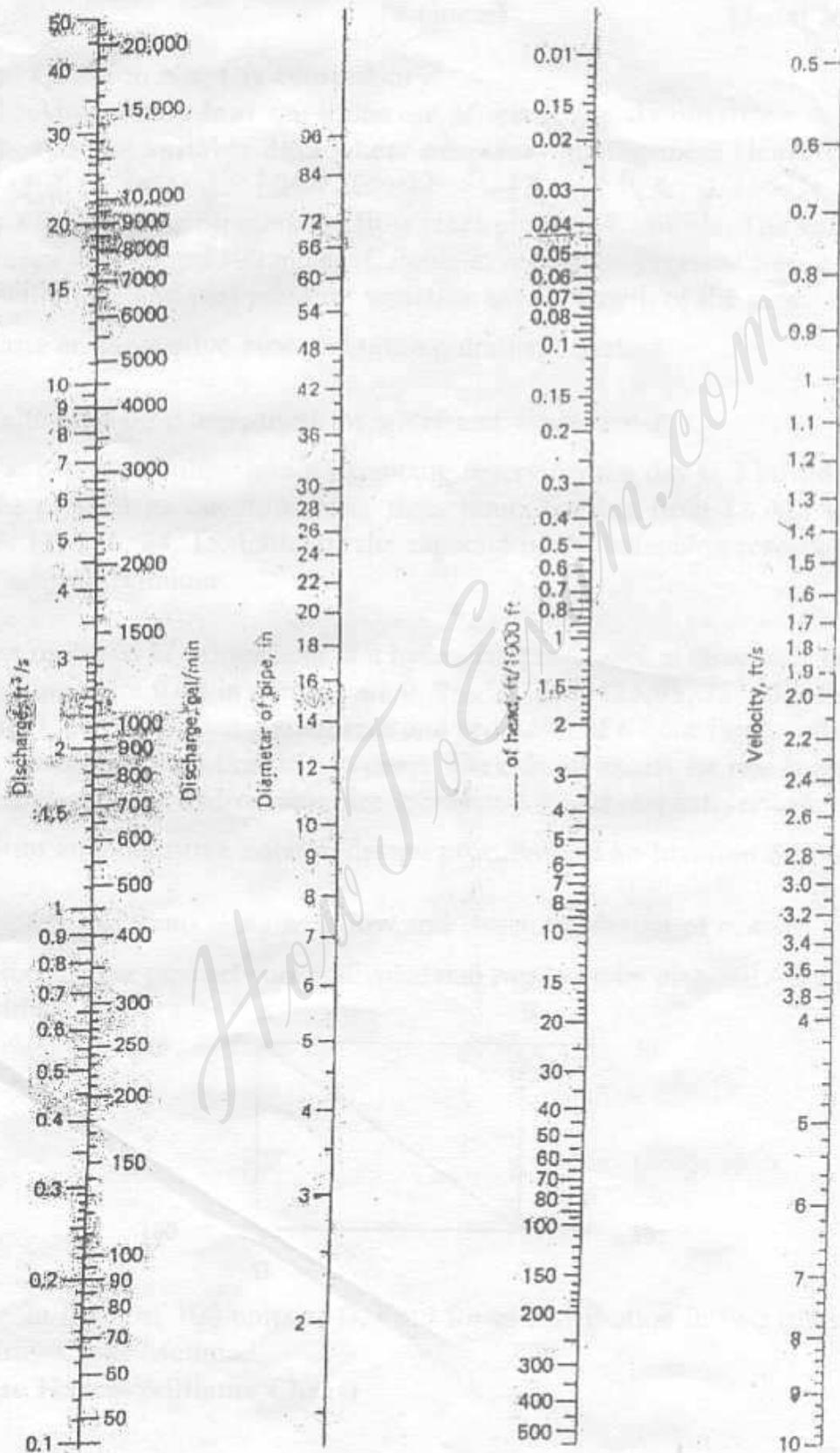
- 5. (a) Design a sewage pumping station with the following data, with suitable assumptions and draw a neat sketch of the proposal. Population - 2,50,000, Water supply - 135 lpcd, ratio of max to min flow - 2, length of rising main - 2.5 km, Gross static lift - 5 m. 10
- (b) Estimate the population and water use and total average daily water demand in the year 2060 from the following table: (Use least square method.) 10

Year	1990	2000	2010	2020	2030	2040	2050
Population (Thousand)	46	55	73	86	98	110	125
Average flow (m ³ /day)	6.21	7.425	9.855	11.61	13.23	14.85	16.875

- 6. (a) Write notes on cleaning and maintenance of sewers. 10
 - (b) A 3 m diameter sewer carrying 3 cumecs discharge in the sump well of a sewage pumping station. The sewer is laid at a slope of 1:5000. Trace the water surface profile when the water level at the discharge point rises 3 m above the invert level. Take $n = 0.013$. 10
7. Write note on any **four** of the following :— 10
- (a) Optimized design of pumping station based on present worth
 - (b) Determination of capacity of balancing reservoir
 - (c) Fire protection services in high rise building
 - (d) Computer programs used for hydrology and hydraulics of water and waste water
 - (e) Salient features of rational method
 - (f) Head discharge relationship for a centrifugal pump.



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Nomogram for Hazen-Williams formula for $C = 100$.