



Answer all the following Questions (assume any missing data)

Marks

Question (1)

[20]

Discuss the different types of pipes used in water distribution networks and sewerage systems provide advantages and disadvantages for each (20)

Question (2)

[30]

Given the network shown in Fig. 1, the inflow at A, and outflows at B, C and D. Using Hardy Cross method, find the flows in the individual pipes comprising the network (only two trials are required).....(30)

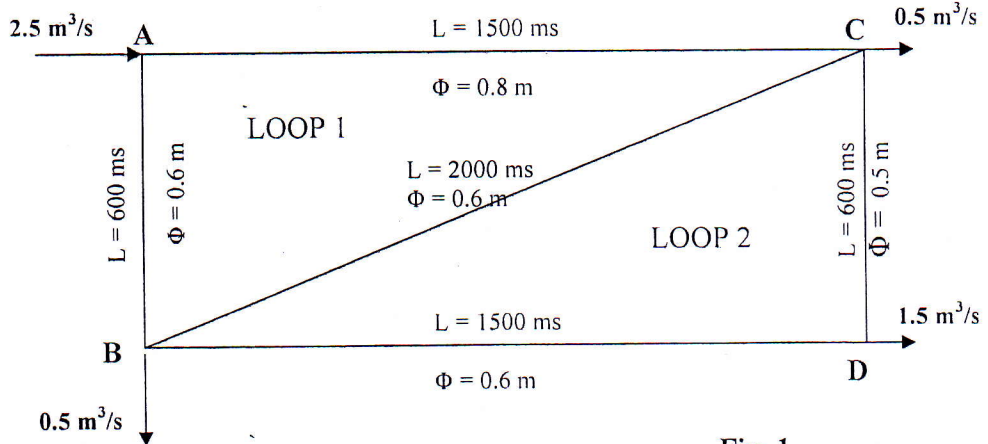


Fig. 1

Question (3)

[25]

- (a) Mention five different methods for prediction of future population (5)
- (b) The following table shows the population in millions of a country during the years 1975 – 2015, in five years intervals. (20)

Year	1975	1980	1985	1990	1995	2000	2005	2010	2015
Population (million)	10.1	11.4	13.2	14.4	15.8	17.2	19.9	22.2	24.6

- 1) Find the equation of the least square parabola fitting the data.
- 2) Estimate the population in 2040 & 2070

Knowing that :

$$\Sigma Y = aN + b\Sigma X + c\Sigma X^2$$

$$\Sigma XY = a\Sigma X + b\Sigma X^2 + c\Sigma X^3$$

$$\Sigma X^2 Y = a\Sigma X^2 + b\Sigma X^3 + c\Sigma X^4$$

Question (4)

[25]

- a) Draw Oxygen Sag Curve showing all components and parameters. (10)
- b) A stream with DO has a flow of 1.2 m³/sec, BOD₅ of 4 mg/l and reoxygenation constant of 0.3 per day. It receives an effluent discharge of 0.25 m³/sec having BOD_w 20mg/l, DO 5mg/l and deoxygenation constant 0.13 per day. The average velocity of flow of the stream is 0.18 m/sec. Calculate DO deficit at point 20 km downstream. (Temperature can be taken as 20°C and Saturated DO at 20°C = 9.17 mg/l) (15)

Knowing that Streeter-Phelps equation:

$$D = K_D L_0 / (K_R - K_D) [10^{-K_D t} - 10^{-K_R t}] + D_0 10^{-K_R t}$$

and $L_t = L_0 [1 - 10^{-K_D t}]$

End of Exam - Good luck

This exam measures the following ILOs														
Question Number	Q1	Q2-a	Q2-b	Q3-a	Q4-a	Q2	Q3-b	Q4-a			Q2	Q3-b	Q4-b	
	a1-1	a1-2	a1-1	a1-2	a1-2	b2-1	b2-1	b2-1			c1-1	c1-1	c1-1	
Skills	Knowledge & Understanding Skills					Intellectual Skills					Professional Skills			