

2016

CIVIL ENGINEERING — PAPER - II

Time Allowed : 3 Hours

Full Marks : 200

If the questions attempted are in excess of the prescribed number, only the questions attempted first up to the prescribed number shall be valued and the remaining ones ignored.

Answers may be given either in English or in Bengali but all answers must be in one and the same language.

Group AAnswer any four questions

1. Write short notes on the following (any four)

- Water distribution layouts
- Corrections in chaining
- CBR test
- Slack and float
- Adsorption process in water treatment

(8x4)

2. (a) Show with a neat sketch, the methods of taking a house connection for water supply.
 (b) List with sketches the various systems of plumbing used for house drainage.
 (c) List the various construction equipments which are generally used in the construction projects.

(10+12+10)

3. (a) What are the prime objectives of water and wastewater treatment?
 (b) Draw a typical flow sheet of conventional treatment of municipal wastewater and mention the function of various unit processes.
 (c) Define 'primary', 'secondary' and 'tertiary' treatment of wastewater with suitable examples.

(6+15+11)

4. (a) What is orientation of plane table? Discuss the methods of orientation.
 (b) Discuss different methods of plane tabling.

(15+17)

5. (a) What do you mean by well development? Discuss different problems associated with well construction.

- (b) Equilibrium pumping test was conducted with a 100 mm diameter well at a rate of $10 \text{ m}^3/\text{hr}$ in an confined aquifer of 10 m depth. The drawdown at two observation wells at a distance of 10 m and 30 m from pumping well were found to be 0.5 m and 0.2 m respectively. Find the following parameters if piezometric head is 15 m:

P. T. O.

- i. The co-efficient of permeability and transmissibility
- ii. Radius of influence
- iii. Find drawdown at the well
- iv. Plot distance drawdown curve

(12+20)

6. (a) Explain the sight distance and factors causing restriction to sight distance. Explain the significance of stopping, intermediate and overtaking sight distances.
- (b) Calculate the stopping sight distance for a design speed of 100 kmph. Take the total reaction time 2.5 seconds and coefficient of friction = 0.35.
- (c) Why transition curves are provided in highways?
- (d) A national Highway passing through rolling terrain in heavy rainfall area has a horizontal curve of radius of 500 m. Design the length of transition taking the data given: design speed = 80 kmph; pavement width = 7.0 m; allowable rate of introduction of super elevation = 1 in 150; no of lanes = 2; wheel base = 6 m.

(8+8+4+12)

Group BAnswer any two questions

7. (a) A chain line ABC crosses a river, B and C being on the near and distant banks respectively. The line MB of length 65 m is set out at right angles to the chain line at B. If the fore bearings of BM and MC are 267° and 42° respectively, find the width of the river.
- (b) A closed traverse is conducted with five stations A, B, C, D and E taken in anticlockwise order, in the form of a regular pentagon. If the FB of AB is $30^\circ 00'$, find the FB of the other sides.
- (c) The distances along a sloping ground were measured with 30.0 m chain were 28.7, 23.4, 20.9 and 29.6 m respectively and the corresponding slope angles were found to be 3° , 5° , 7° , 10° respectively. It was noted afterwards that the chain was 0.025 m too short. Find the true horizontal distance.

(9+15+12)

8. (a) Explain Abrams water-cement ratio law in context of compressive strength of concrete. What are the limitations of Abram's law?

Contd...P/3.

- (b) How gel-space ratio is related with compressive strength of concrete? Calculate the theoretical strength of sample of concrete made with 400 gm of cement with 0.45 water/cement ratio, on full hydration and at 60 percent hydration.
- (c) Discuss about the 'maturity of concrete'.
- (d) Laboratory experiments conducted at Kolkata on a particular mix showed 30 MPa for fully matured concrete. Find whether formwork of slab can be removed for an identical concrete placed at Gangtok at the age of 21 days (when cured at an average temperature during day time 10°C and night time 3°C) if the concrete is likely to be subjected to a stripping stress of 25 MPa. (Given: for 30 MPa, A=21 and B=61).

(6+12+6+12)

9. (a) A town has a population of 100000 persons with a per capita water supply of 200 liters/day. Design a sewer running 0.8 times full at maximum discharge. Take a constant value of $N = 0.013$ at all depths of flow. The sewer is to be laid at a slope of 1 in 1000. Take a peak factor of 3. Assume 85% of water supplied will be wastewater. Refer Figure 9.a.

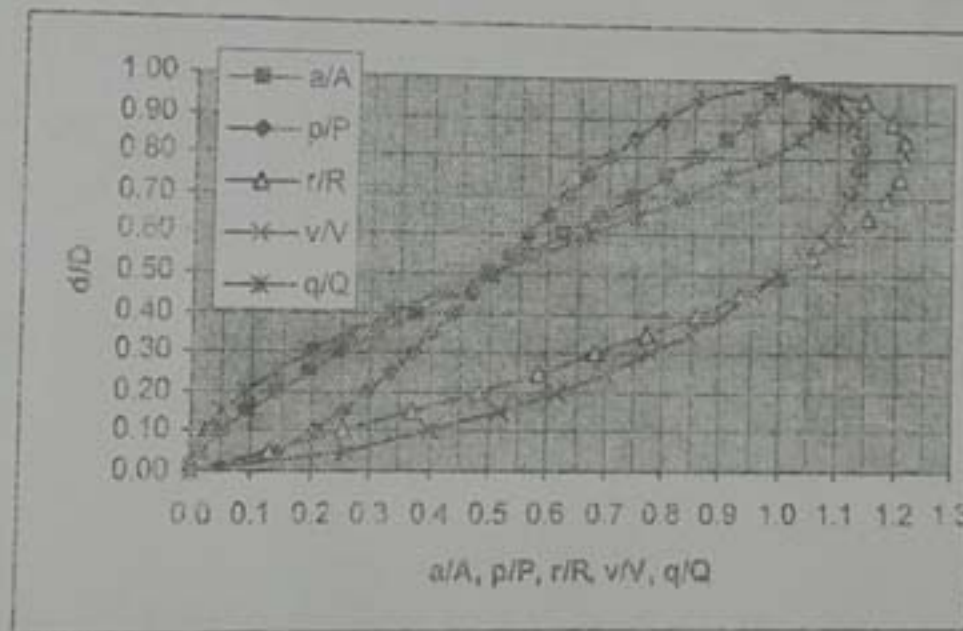
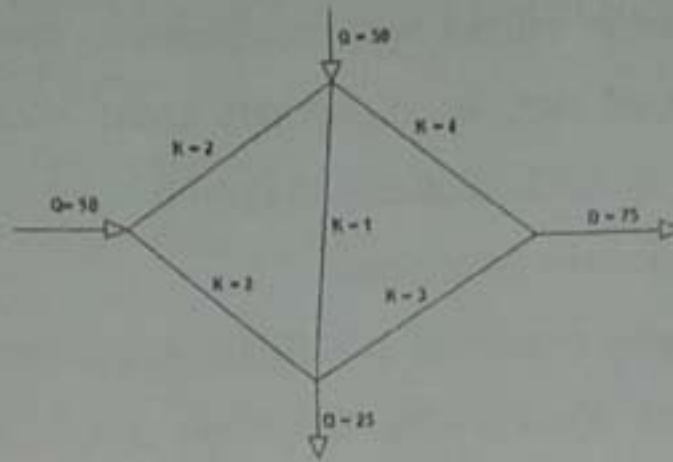


Fig 9.a: Hydraulic elements of sewer

- (b) A water supply scheme is to be designed for serving people of 2 lakhs. Storage reservoir is 6 km away from the city and loss of head from source to city is 20 m. Calculate the size of the pipe assuming average daily demand of 135 lpcd and half of the daily demand is to supply in 8 hours. Use $C = 130$.
- (c) A pipe network consists of the following pipes. Find the flow through each pipe using Hardy Cross method.



(15+6+15)

10. (a) Describe briefly the pumping test procedure to estimate aquifer parameters in unsteady condition.
- (b) Write Jacob's equation for pumping of an aquifer at unsteady condition.
- (c) Following observations were made at an observation well at a distance of 30m while pumping was done at a rate of 300 L/min. Using Jacob's equation calculate transmissibility and coefficient of storage of the aquifer.

Time, min	2	3	5	6	7	9	12
Drawdown, cm	1	7	15	18	21	25	30

(15+5+16)