

Time Allowed : 3 Hours

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. (a) A steel tape was exactly 30 m long at 20°C when supported throughout its length under a pull 15 kg. A line was measured with a pull of 10 kg applied to the tape at a mean temperature of 13°C and found to be 810 m long. The cross sectional area of the tape = 0.03 cm², total weight of tape = 0.65 kg., α for steel = $11 \times 10^{-6}/^{\circ}\text{C}$ and E for steel = $2.1 \times 10^6 \text{ kg/cm}^2$. Compute the true length of the line if the tape was supported during measurement - (i) at every 30 m and (ii) at every 15 m. 12
- (b) The following readings are successively taken from an instrument in a leveling work : 0.255, 0.385, 0.520, 1.785, 1.895, 2.300, 1.785, 0.335, 0.858 and 1.255. The position of the instrument was changed after taking 3rd and 6th readings. Draw out the form of a level field book and enter the above reading properly. Assume the R.L. of the first point as 80.0 m. Calculate the R.L.s of all the points in Rise and Fall system and apply usual arithmetic check. 12
- (c) Give the Bessel's graphical solutions to 'three point problem'. When does it fail ? 8
2. (a) Distinguish between hietograph and hydrograph. 4
- (b) Lists the factors affecting a flood hydrograph. Discuss the role of these factors. 2 + 10
- (c) What is an Unit Hydrograph (UH) ? State and explain the assumptions involved in the UH theory. 2 + 6
- (d) The peak flood hydrograph due to a 3-h duration isolated storm in a catchment is 270 m³/s. The total depth of rainfall is 5.9 cm. Assuming an average infiltration loss of 0.3 cm/h and constant base flow of 20 m³/s.
- (i) Estimate the peak of the 3-h UH of this catchment.
- (ii) If the area of the catchment is 567 km² determine the base width of the 3-h UH by assuming it to be triangular shape. 4 + 4
3. (a) With help of a sketch, explain the reactions that happen at different stages of the breakpoint chlorination curve. Also, state the importance of breakpoint chlorination in water treatment. 18
- (b) The BOD₅ of a waste has been measured as 600 mg/l. If $k_1 = 0.23/\text{day}$ (base e), what is the ultimate BOD_u of the waste ? What proportion of the BOD_u would remain unoxidised after 20 days ? 14

4. (a) (i) Name the tests to measure workability of fresh concrete.
(ii) What is a super plasticizing admixture ?
(iii) What are the three basic qualities of high performance concrete ? Discuss the contradictions.
(iv) What is creep of concrete ? 4 x 4
- (b) Briefly answer the following :-
(i) How can an existing bar chart be modified to depict the project progress made ?
(ii) Differentiate between the terms 'Activity' and 'Dummy'.
(iii) Differentiate between 'Forward Planning' and 'Backward Planning' for network construction.
(iv) Differentiate between 'Optimistic time estimate' and 'Pessimistic time estimate'. 4 x 4
5. (a) Explain briefly the Marshall method of bituminous mix design. 14
(b) Discuss Westergaard's concept of temperature stresses in concrete pavements. 14
(c) Explain the procedure for patch repair works in bituminous pavement. 4
6. (a) What is the purpose of intake structure ? What factors should be considered in locating an intake structure and what are the main considerations in the design of an intake structure ? 2 + 3 + 5
(b) Explain briefly with neat sketches different system of layout of water distribution network. Also mention for which town or city, each of the above distribution network is suitable with their advantage(s) and/or disadvantage(s). 12
(c) Write short note on :-
(i) Electrostatic precipitators
(ii) Fabric filters. 5 x 2

GROUP - B

Answer any two questions

7. (a) What is meant by 'Duty' and 'Delta' of canal water ? Derive a relationship between duty and delta for a given base period. 4 + 6
(b) Describe briefly the factors affecting duty. 8
(c) Define - (i) Cash crops
(ii) Field capacity
(iii) Kor water depth
(iv) Overlap allowance. 8
(d) After how many days will you supply water to soil in order to ensure sufficient irrigation of the given crop, if
(i) Field capacity of soil = 28%
(ii) Permanent wilting point = 13%
(iii) Dry density of soil = 1.3 gm/cc
(iv) Effective depth of root zone = 70 cm
(v) Daily consumptive use of water for the given crop = 12 mm
Assume any other data, not given. 10

8. (a) Explain briefly the following terms as used in groundwater flow studies :-

- (i) Specific yield
- (ii) Storage coefficient
- (iii) Specific capacity
- (iv) Barometric efficiency

4 x 4

(b) Derive the basic differential equation of unsteady groundwater flow in a confined aquifer. State clearly the assumptions involved.

16 + 4

9. (a) What is 'Trunnion axis adjustment' ? Why it is needed ? How the adjustment is done ?

2 + 2 + 12

(b) From a common point A, traverse are conducted on either side of a harbour as follows :-

| Traverse - 1 | | |
|--------------|-----------|--------------|
| Line | Length(m) | Bearing |
| AB | 200 | 85° 26' 20" |
| BC | 100 | 125° 10' 40" |
| Traverse - 2 | | |
| AD | 225 | 175° 50' 00" |
| DE | 500 | 85° 06' 40" |

Calculate the distance from C to a point F on DE, due south of C and the distance EF. 20

10. (a) Briefly explain five important factors which should be considered for selection of equipment for a construction Project. 10

(b) What is an admixture ? List four different mineral and chemical admixtures. 10

(c) List the factors that influences the basic permissible compressive stresses for masonry for different mortars. Also elaborate the modification due to each factor. 10

(d) Explain the concept of 'Global Positioning System (GPS)'. 6

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