RP–IX–XII–14

52   *2011*

CIVIL ENGINEERING

SECOND PAPER

Full Marks : 200

Time : 3 hours

A candidate shall answer questions only
from *any* **two** Parts

PART—A

(Building Construction)

Answer *any* **ten** questions

Each question carries 10 marks

1. What is seasoning of timber? Discuss the various methods of timber seasoning stating their advantages and disadvantages.

2. What is cement? What are the essential constituents of Portland cement? State their functions.

3. Write briefly on the following :
   (a) Bulking of sand
   (b) Plaster of Paris
   (c) Rubble masonry
   (d) Fire hazard of buildings

(Turn Over)

4. Describe, with neat diagram, the manufacturing process of bricks by Hoffman's kiln.

5. Describe the different classes of buildings as per the National Building Code of India.

6. What do you mean by workability? Explain the factors affecting workability of concrete. Write about slump test of concrete.

7. What is concrete mix design? How is it performed? Elucidate the IS code procedure for concrete mix design.

8. An office building is to be provided with a staircase measuring 3 m × 5 m. If the vertical distance between the floor is 3·6 m, design the staircase making suitable assumptions. Draw the plan and section of the staircase.

9. Write a note on the various types of doors and windows provided in buildings. Discuss the principles to be followed for proper location of doors and windows.

10. What is mortar? Name different types of mortar used in masonry work. State the requirements of good mortar.

(*Continued*)

11. Classify roofs into different categories. Discuss the requirements of a good roof for building.

12. Explain with the help of sketches, the various types of building foundation. Also discuss the requirements of a good foundation. How is a pile foundation constructed?

13. Why is flooring provided in buildings? Enumerate various types of flooring used. Explain the procedure of laying concrete flooring in ground floor with marble finish.

14. What is layout of a building? How is it done? Give steps and sketches.

PART—B

(Railways and Highways Engineering)

Answer *any ten* questions

Each question carries 10 marks

15. What are the various methods of classifying roads? Briefly outline the classification based on location and function as suggested in the Nagpur Road Plan.

16. Define highway alignment. Explain with sketches the various factors which control highway alignment.

17. Derive an expression for finding the stopping sight distance at level and at grades. Calculate the stopping sight distance for a design speed of 100 kmph. [Assume total reaction time as 2·5 second and the coefficient of friction = 0·35.]

18. What is the necessity of horizontal curve in a highway? How is it provided? The radius of a horizontal circular curve is 100 m. The design speed is 50 kmph and the design coefficient of lateral friction is 0·15. Calculate—

    (a) the superelevation required if full lateral friction is assumed to develop;

    (b) coefficient of friction needed if no superelevation is provided;

    (c) equilibrium superelevation if the pressure on the inner and outer wheels are to be equal.

19. Enumerate the different methods of carrying out traffic volume studies. Indicate the principle of each method. How is the traffic volume data used in traffic engineering?

20. What are the desirable properties of bituminous mixes? What are the steps in bituminous mix design? Discuss.

12T—100/80   (Continued)

21. Explain the CBR method of pavement design. How is this method useful to determine thickness of component layers? Elaborate on the advantages and disadvantages of CBR method.

22. What is WBM road? Specify the materials required for construction of WBM road. What are the uses and limitations of this type of road?

23. What do you mean by train resistance? Explain the various resistances which a locomotive has to overcome before hauling a train. A train with a total load of 1000 tons is ascending a slope of 1 in 125. Calculate the resistance due to slope.

24. Define permanent way. Discuss briefly the requirements of an ideal permanent way. Write a note on the function of rails in a railway track.

25. What is the necessity of joints in rails? List the various types of fastenings used in railway track and describe in detail any two of them.

26. What are the function of sleepers? What are the requirements of an ideal material for sleeper? Explain briefly the following :

    (a) Sleeper density

    (b) Transverse sleeper

    (c) Prestressed concrete sleeper

12T—100/80

27. What are the objectives of providing transition curve in railway track? Enumerate the essential requirements of an ideal transition curve. Calculate the length of a transition curve for an MG curve of four degrees having a cant of 80 mm. The maximum permissible speed on the curve is 60 kmph.

28. What is the necessity of signalling in a railway track? Describe the various types of signals used based on *(a)* function and *(b)* location.

PART—C

(Water Resources Engineering)

Answer *any* **ten** questions

Each question carries 10 marks

29. In a 500 km^2 watershed, isohyets were drawn for the following data for a rainfall during a storm. Calculate the average rainfall in the watershed.

Isohyet interval (cm)	20–17	17–14	14–11	11–8	8–5	5–2
Inter isohyet area (km^2)	71·5	125·0	110·5	75·0	50·0	68·0

30. Describe a method for measurement of infiltration. Why is it advisable to conduct experiments with concentric cylinders, and not with just one cylinder?

12T—100/80   (*Continued*)

31. Describe the general equation which is used for frequency analysis of hydrologic events. List the three important parameters required for the analysis.

32. The flood frequency for a stream has been found to be as follows :

Return period (years)	Peak discharge (m^3/sec)
10	109·00
200	244·00

Estimate the peak discharge for the return periods of 400 and 5 years by using the Gumbel method.

33. Define unit hydrograph. List the assumptions and limitations of unit hydrograph. Explain few uses of unit hydrograph method in hydrological analysis.

34. A 400 mm diameter well fully penetrates a confined aquifer of permeability 40 m/day. The length of the strainer is 20 m. Under steady-state of pumping, the discharge from the well was 1500 litre/minute. Compute the drawdown at the well if the radius of influence of the well is 400 m.

35. What is consumptive use of water? Describe any two methods for determining the consumptive use of water.

12T—100/80 (Turn Over)

36. Using Lacey's equation, design a channel to carry 10 cumecs of water in a sandy area having average particle size of 0·40 mm.

37. Discuss various measures which may be taken up to prevent waterlogging as well as to relieve the land which is already waterlogged.

38. Discuss various methods of bank erosion control for a braided river.

39. Describe the following terms stating their significance with respect to a dam project :

    (a) Spillway design flood

    (b) Probable maximum flood

40. What are the modes of failure of a gravity dam? Describe each of them with diagrams.

41. Discuss the thin cylinder theory for design of an arch dam and find the expression for calculating the thickness of the arch ring.

42. What do you understand by life of a reservoir? What measures may be taken to prolong the life of a reservoir?

12T—100/80   (Continued)

PART—D

(Sanitation and Water Supply)

Answer *any* **ten** questions

Each question carries 10 marks

43. What are the various sources of water used in water supply works? Discuss their merits and demerits from quality and quantity point of view.

44. Draw neat sketch for different types of water distribution network. Discuss in brief advantage and disadvantage of each.

45. What is a settling tank? Explain the theory governing design of settling tank with reference to detention time, flow through period, horizontal velocity, settling velocity, particle size, etc.

46. Discuss in detail the cause and effects of various physical and chemical impurities in water.

47. Water is to be pumped from a tube well to an overhead tank 15 metres above ground level (GL), given the following data :

    (i) Daily pumping 5 hours = 100000 litres

    (ii) Water table below GL = 5 metres

    (iii) Maximum pumping depression = 2 metres

12T—100/**80** (*Turn Over*)

(iv) Head loss in pump, main and bend =
$$1{\cdot}0 \text{ metre}$$

(v) Efficiency of pump = 60%

(vi) Efficiency of motor = 75%

Work out the capacity of pump and motor. Assume suitable values of any data that may be necessary.

48. Discuss and differentiate between slow and rapid sand filtration. Give sketches.

49. The water supply to a town is done by a 20 km long pipe from the intake reservoir to service reservoir. The difference in level of the reservoirs is 100 metres. The discharge is 50 m.l.d. subsequently, the discharge has to be increased to 75 m.l.d. To meet the extra demand, another pipe of same diameter is laid along first part and cross-connected. Calculate—

(a) the size of the pipe main;

(b) the length of the additional pipeline to be laid.

[Take $f = 0{\cdot}01$ and head loss in cross-connection $= 1{\cdot}50$ metres.]

50. Write briefly on :

(a) Chlorination of water

(b) Settling tank

12T—100/80   (Continued)

51. State the basic principles governing the design of water supply in buildings with particular reference to the quantity of flow, the determination of the pipe size and the layout of the pipe system.

52. Describe the separate and combined systems of sewerage. What are the relative advantages and disadvantages of the two systems?

53. How does the sewage flow fluctuate during a 24-hour period? What are the effects of such fluctuations on the design of sewers? Explain the term 'self-cleaning velocity' and 'limiting velocity' in sewers.

54. Distinguish between surface drains and underground drains. Why are surface drains needed? What are the factors which affect the alignment and section of surface drains?

55. Explain briefly the specifications for the construction of a manhole. Provide a neat sketch of a drop manhole and explain its functioning.

56. What are the objectives of sewage analysis? List the various physical and chemical tests for sewage. Explain the terms 'dissolved oxygen' and 'biochemical oxygen demand', focussing on their significance in sewage analysis.

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