QDB – 35

CIVIL ENGINEERING

Time : 3 Hours]   [Total Marks : 200

Instructions : 1) The question paper has been divided into ***three*** parts, ***"A", "B"*** and ***"C"***. The number of questions to be attempted and their marks are indicated in ***each*** Part.

2) Medium of question paper is "***English***". Please write in ***English language only***.

3) Answer to ***all*** questions of ***each*** Part should be written continuously in the script and should ***not*** be mixed with those of other Parts. In the event of candidate writing answers to questions in a Part different to the one which the question belongs, the question shall not be assessed by the examiner.

4) The candidate should write the answer within the limit of words prescribed in the Parts "***A***", "***B***" and "***C***".

PART – A   **Marks : 40**

Instructions : 1) Question No. **1** to **20**.

2) Attempt **all 20** questions.

3) **Each** question carries **2** marks.

4) Answer should be given approximately in **20** to **30** words.

1. Define the principal stresses.

2. Derive the relationship between Modulus of Elasticity (E) and Modulus of Rigidity (G).

3. What is point of contraflexure ?

4. What is influence line diagram ?

5. What is passive earth pressure ?

6. Enumerate the shear strength tests for soil.

7. What is river training works ?

P.T.O.

8. What are the characteristics of laminar flow ?

9. Differentiate between rotational and irrotational flow.

10. State the factors that affect the rate analysis.

11. State the factors on which the amount of camber to be provided depends.

12. Define Sludge Volume Index (SVI).

13. Explain break point chlorination.

14. State four major measures adopted for the control of waterlogging.

15. What is the difference between 'Hydraulic Lime' and 'Slaked Lime' ?

16. Convert the following quadrantal bearings into whole circle bearings :

    a) N 30° 40′ W

    b) S 20° 10′ E.

17. What is a contour line ?

18. Define the term 'Interlocking' used in Railway Engineering.

19. Write the components of a flexible pavement from bottom to the top.

20. What is 'Spire test' ?

<div align="center">PART – B</div>   **Marks : 60**

Instructions : 1) Question No. **21** to **32**.
2) Attempt **all 12** questions.
3) **Each** question carries **5** marks.
4) Answer should be given approximately in **50** to **60** words.

21. A 4 m long hollow circular strut with both ends fixed carries an axial load of 50 kN. If the permissible stress is 100 N/mm^2 and the strut is long for which critical load and crushing loads are equal, determine the external and internal diameters of the section. Assume E = 200 kN/mm^2.

22. Write the steps adopted in the design of a Base Plate.

23. A rectangular settling tank without mechanical equipment is to treat 1.8 million liters per day of raw water. The sedimentation period = 4 hours, the velocity of flow = 8 cm/min and the depth of water and sediment = 4.2 m. If an allowance of 1.2 m for sediment is made, determine the length and width of the basin.

24. A section line AB appears to be 10.16 cm on a photograph for which the focal length is 16 cm. The corresponding line measures 2.54 cm on a map with a scale of 1 : 50000. The terrain has an average elevation of 200 m above mean sea level. Determine the flying altitude of the aircraft, above mean sea level, when the photograph was taken.

25. The velocity distribution of a viscous fluid with dynamic viscosity = 0.8 Ns/m^2 flowing over a fixed plate is given by $u = 1.5y^2 + y$ (u is the velocity in m/s and y is the distance from the plate in m). Determine the shear stress at the plate surface and at y = 0.34 m.

26. Define the term 'Bleeding' in concrete technology. State the causes of bleeding.

27. Explain the working principle of the Oxidation Pond.

28. What are the factors to be considered for selecting suitable type of cross-drainage work ?

29. Explain the purpose of providing 'Points and Crossings' in railways. Define Split-switch and Wharton safety switch.

30. Define various time estimates used in PERT analysis. Define probabilistic time for completion of an activity.

31. Explain Mohr-Coulomb's theory for shear strength.

32. Draw neat sketches of English and Flemish bonds for brick masonry.

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PART – C

Marks : 100

Instructions : 1) Question No. **33** to **39**.

2) Attempt **any 5** out of **7** questions.

3) **Each** question carries **20** marks.

4) Answer should be given approximately in **200** words.

33. A reverse curve is to be set out between two parallel tangents 30 m apart. The line joining the two tangent points is 300 m. The two arcs of the curve have the same radius. Determine the radius of the curve. In addition, determine the offset data required to set out the curve on the field from a long chord at an interval of 20 m from the common tangent point.

34. A masonry dam 10 m high is trapezoidal in section with a top width of 1 m and bottom width of 8.25 m. The face exposed to water has batter of 1 : 10. Check the stability of the dam. In addition, determine the principal stresses at the toe and heel of the dam. Assume unit weight of masonry as 22.4 kN/m^3 and unit weight of water as 9.81 kN/m^3.

35. Starting from first principle, derive Hagen-Poiseuille Equation for steady laminar flow through pipes. Establish a relation between Darcy-Weisbach friction factor and Reynolds Number for laminar flow.

36. For a beam (width = 250 mm ; depth = 400 mm), determine the area of tension steel required to be provided to make the section as a balanced section. Use M20 grade of concrete and HYSD bars of Fe415 steel. Find your answer by

a) Working stress method ;

b) Limit state design method.

37. Explain the Westergaard's assumption(s) for stress distribution in soil mass. How it is different from Boussinesq theory for stress distribution in soil ?

38. A two-hinged arch of 20 m rise is subjected to a uniform load of 50 kN/m over left half of span. Determine maximum and minimum bending moments in the arch. Assume secant variation of flexural rigidity.

39. What do you understand by attached growth process and suspended growth process ? Explain with the help of a neat sketch, the biological process involved in working of an activated sludge process.

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