R16

Sem-VI-CBCS-KT

Time: 3hour   Max. Marks: 80

Note   1.   Question No **1 is compulsory**.
        2.   Attempt Any **3** out of remaining
        3.   Assume any suitable data wherever required.

Q1   Solve any Four   20 marks (5marks each)

A   State the requirements of an ideal permanent way

B   It is observed that at present tracks, are mostly laid with flat-footed rails. Give reasons for this preference in relation to other types of rail sections

C   Draw cross section of Permanent track and mention the function of each component

D   Design a turnout of 1 in 16 for an urban city in Maharashtra having plain terrain for 90R rails using Cole's method.

E   Define Cant deficiency, Cant and Negative superelevation with IRC recommendations

Q2   Solve BOTH   20 Marks

A   Define superelevation. Why is it necessary to provide superelevation on the   10m
     curves of a railway track?

B   A maintenance engineer on site examines that the expansion gap in the track is   10m
     less than the permissible value, name the defect and what can be the causes and
     how can it be rectified.

Q3   Solve BOTH   20 Marks

A   A BG 1^0 branch line track takes off as a contrary flexure through a 1 in 8.5   10
     turnout from a main line track of 3^0 curvature. Due to the turnout, the
     maximum permissible speed on the branch line is 40 km/h. Calculate the super
     elevation to be provided on the branch line track and the maximum permissible
     speed on main line track (when it takes off from straight track)

B   Define creep and its causes and effects. Also explain various theories of   10
     creep with neat sketch

Q4   Solve BOTH   20 Marks

A   Differentiate in detail the markings and lighting between the runway and   10m
     taxiway that can help pilots maneuver safely and efficiently, also draw
     a layout of the airport

B   Explain Windrose diagram in detail   10m

Q5   **Solve BOTH**   **20 Marks**

A   Define bearing and types of bearings used in Bridge   10m

B   Explain briefly the different types of gradients.   10m

Q6   **Solve BOTH**   **20 Marks**

A   Discuss the factors on which sleeper density depends. How is sleeper   10m
density expressed? Determine the number of sleepers required for the
construction of a 640mt long BG railway track, ensuring a sleeper
density of (N + 7).

B $5°$ curve diverges from a $3°$ main curve in the reverse direction in the   10m
layout of a broad gauge yard. If the speed on the branch line is
restricted to 35 km/h, determine the restricted speed on the main line

2:30pm

CE - R16

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[3 Hours]   **[Total Marks: 80]**

Note: 1. Question **1** is compulsory
       2. Attempt any **3** questions from Q.2 to Q.6
       3. Assume any suitable data where ever required

Q.1   Attempt any **four**
   a. Enlist the assumptions made in Terzaghi's Theory of consolidation   05
   b. Compare Rankine's and Coulombs lateral earth pressure theory.   05
   c. Explain Mohr-Coulomb's criteria for shear strength of soils.   05
   d. Classify the driven piles according to the function of soil. Support the answer   05
       with proper figure.
   e. Explain briefly the limitations of plate load test   05

Q.2 a. Explain with neat sketch Swedish Method of Slices for C-Φ soil.   05
         b. Discus the effect of water table on lateral earth pressure.   05
         c. The void ratio of clay A decreased from 0.572 to 0.505 under a change in   10
             pressure from 120 to 180 kg/m^2. The void ratio of clay B decreased from
             0.612 to 0.597kg/m^2 under the same increment of pressure. The thickness of
             sample A was 1.5 times that of B. Nevertheless, the time required for 50%
             consolidation was three times longer for sample B than for sample A. What is
             the ratio of the coefficient of permeability of sample A to that of sample B?

Q.3 a. Explain the factors affecting bearing capacity of soil.   05
         b. Explain with neat diagram Rehbann's graphical solution for active earth   10
             pressure.
         c. Write short note on Taylor's stability number?   05

Q.4 a. In a drained compression test, a saturated specimen of cohesionless sand fails   10
             at a deviator stress of 450kN/m^2 when the cell pressure was 135 kN/m^2 . Find
             the effective angle of shearing resistance of sand and the angle of inclination
             of the failure plane with the horizontal.
         b. State the merits and demerits of Direct shear test.   05
         c. What are the causes and effects of Negative skin friction? Explain the   05
             remedial measures to minimize it .

Q.5 a. Determine the load carrying capacity of a group of 9 piles. Diameter of pile is   10
             400mm, length of pile 15 m long, Properties of sand are C=0, ϕ=35^0, γ_d=15
             KN/m^3 and γ_{sat} =17 KN/m^3., $K_s$tanδ=1.5, critical depth of pile as 7.5 times
             diameter of pile, N_q=70, Properties of clay is γ_{sat} =16 KN/m$^{3.}$ Soil deposit
             consist of sand of 20 m thick followed by 4m thick clay layer. The Ground
             water level is observed at 2m from Ground surface. Also determine the
             settlement of group piles in clay. Take Cc / (1+e$_0$) = 0.22

         b. Explain the procedure of Pile Load Test. How is the allowable load   10
             calculated as per IS recommendations?

Q.6 **a.** A retaining wall 6.8m high retains soil having the following properties. The   **10** backfill is horizontal and carries a surcharge of $20 KN/m^2$,C=25 KN/m^2 and, $\phi = 22°$ and $\gamma = 18 kN/m^3$. Draw the active earth pressure diagram.
i) When tension crack occurs
ii) When tension crack does not occur.

b. A loading test was conducted with a 300mm square plate of size 1.5 m wide   **10** at depth of 1.5 m below the ground surface in pure clay deposit. The water table is located at a depth of 4m below the ground level. Failure occurred at a load of 45kN. What is the safe bearing capacity strip footing with following dimension on the same soil? Assuming the γ =18kN/ m^3 above the water table and a factor of safety of 2.5. (For ϕ=0 ^{0}, N0=5.7, Nq=1, Nγ=0)