

CENTRAL PUBLIC WORKS DEPARTMENT
DEPARTMENTAL EXAMINATION FOR AEE (CIVIL)
FEB 2021

Civil Engineering Paper-II
(With Books)

Time: 3 hours

Maximum Marks: 100

(Non-programmable scientific calculator will be permitted)

Attempt all questions

1. (i) Describe the steps involved in fixing alignment for hill roads using satellite imageries.
(ii) What are the advantages of using satellite imageries viz-à-viz other traditional methods?
(iii) How does DGPS (Differential GPS) work? (5+2x2.5)

2. (i) Describe the steps involved in the flexible pavement design of roads as per IRC:37-2018.
(ii) Ten jack hammer holes are expected to break 20 cum of solid medium hard rock. What will be the charge per hole? Assume blasting ratio as 4 cum per kg. (7+ 3)

3. A masonry retaining wall of trapezoidal section has its top width equal to 0.75m and height 5 m. Its face which is in contact with the retaining earth is vertical. The earth retained is level at top. The soil weighs 16 KN/m³ and its angle of internal friction is 30°. The masonry weighs 24 KN/m³. Determine minimum width of the base to avoid tensile stresses and determine the maximum compressive stresses for this base width. If the coefficient of friction between base and the soil is 0.60. Also check the stability of the retaining wall against sliding. (2X5)

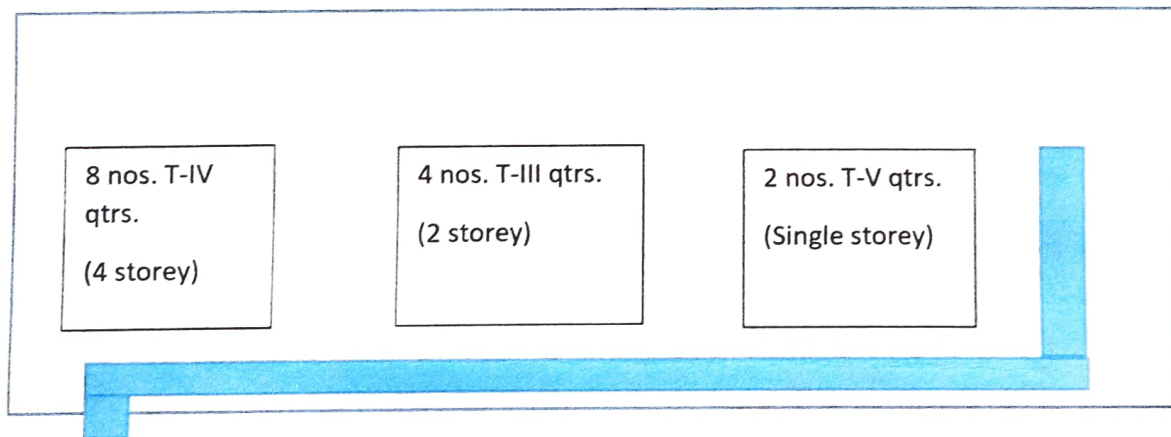
4. (i) Enumerate the functions of transverse reinforcement in a reinforced concrete column.
(ii) Compare the behaviour of tied columns with spiral columns, subject to axial loading.
(iii) Draw sketch of arrangement of main reinforcement in one way continuous slab with and without bent up bars. (2X3+4)

5. (i) What are the main requirements of a foundation system for structure?
(ii) What are the situations in which combined footings are preferred to isolated footings?
(iii) From structural analyses, it is found that the following stress resultants develop at a column base under the action of characteristic loads:
(a) P(Vertical)= 475 kN, M(Moment)=35 kN-m under dead loads
(b) P(Vertical)=380 kN, M(Moment)=39 kN-m under live loads
(c) H(Horizontal) = ± 30 kN, P(Vertical)=112 kN, M(Moment)= ±41 kNm under wind loads
Determine the combined loads to be considered in deciding the area of the footing to be located in a soil with an allowable pressure of 200 kN/m² at a depth of 1.5 m below ground level. (2X2+6)

6. (i) What are methods of pre-stressing?
(ii) Calculate the elastic stress distribution at mid-span of the simply-supported beam by combined load approach method and draw stress diagrams for the beam span having span of 12 m and is post-tensioned by a single cable with zero eccentricity at each end and eccentricity is 250 mm at mid-span. The pre-stressing force in the tendon is assumed to be constant along the length of the beam and equal to $P = 1760 \text{ kN}$. (5+5)
7. (i) What is design mix concrete? (ii) What is the difference between machine batched & machine mixed design mix cement concrete and ready mix cement concrete? (iii) Which kind of cement to be used for concreting in cold climate? (4+3+3)
8. (i) What is the meaning of cement treated sub base and base courses in road construction?
(ii) Indicate situations where cement treated sub base and base courses can be used.
(iii) Compare the advantage and disadvantage viz-à-viz traditional stone courses. (4+2X3)
9. (i) Describe different of valves used in water distribution system with sketches and indicate situation utility?
(ii) What are the design considerations for a pumping station in water supply scheme in residential complex? (2X5)

OR

Design water supply scheme with distribution grid lines for a colony having size of 100mX200m with residential blocks as per following: Assume location of UG Sump in the plot and value of any other data needed. (10)



10. Explain with neat sketches (i) Bracing system in roof truss (ii) Anchorage of truss with concrete column (iii) Connection of purlin to rafter. (2X3+4)