Code: 9A01702 R09

B.Tech IV Year I Semester (R09) Supplementary Examinations, May 2013

BRIDGE ENGINEERING

(Civil Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks

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1. (a) Explain in detail about various types of loads considered in design of bridges.
   (b) Define the term "impact factor" and specify the importance of site investigation in bridge design.

2. A reinforced concrete box culvert of prismatic form with a clear vent way 3.85m by 3.85 is required for a road crossing. The box culvert has to support a superimposed dead load at 8.5 kN/m^2 and a live load of 50 kN/m^2. Density of soil is 18 kN/m^3 and the angle of repose of the soil is 30^0. Adopting M-20 grade concrete and Fe – 415 grade tor steel design the box culvert and sketch the details of reinforcement.

3. A road bridge deck consists of a reinforced concrete slab continuous over tee beams spaced at 2m centers and cross girders spaced at 5m centers. Thickness of wearing coat = 100 mm. Type of loading is IRC class AA or A whichever gives the worst effect. Using M20 grade concrete and Fe 415 grade HYSD bars. Draw the cross section of the deck slab over two spans showing reinforcement details.

4. Design a R.C.C. Tee beam and slab deck to suit the following data.
   Effective span of girders = 16 m, width of kerbs = 600 mm, clear width of roadway = 7.5 m, thickness of wearing coat = 80 mm, No.of main girders = 4, spacing of main girders = 2.5 m, Spacing of cross girders = 4m, Type of loading = IRC class 70 R tracked vehicle – materials, M20 grade concrete and Fe415 grade HYSD bars. Design the deck slab and draw the details of reinforcement.

5. A plat girder bridge deck is to be designed for a B.G. track to suit the following data.
   Effective span of the girder = 15 m
   Dead load of sleepers, rails, fittings = 10 kN/m.
   E.U.L.L for B.M. calculations/track = 1637 kN, E.U.L.L. for S.F. calculations/track = 1806 kN
   Design the plate girder to conform to the IRS loadings and IRC specifications. Sketch the typical c/s of the bridge deck.

6. A single span composite steel girder and an R.C.C. deck slab bridge is proposed for a state highway across a stream. The span of the bridge is 16m and width of the road is 7 m. Slab is supported by 4 numbers of rolled steel joists placed longitudinally symmetrically. Design the R.C.C. deck slab for an equivalent live load of 1250 Kg/m^2 and an impact factor of 0.5. Adopt M15 grade concrete and Fe415 steel HYSD bars.

7. Design an elastomeric pad bearing to support a tee beam girder of a major bridge using the fallowing data:
   Maximum dead load reaction/bearing = 340 kN.
   Maximum load reaction/ bearing = 550 kN.
   Longitudinal force due to friction for each bearing = 35 kN.
   Effective span of the girder = 23 m.
   Estimated rotation at bearing of the girder due to dead and live loads = 0.003 radians. M-20 grade concrete is used. Total estimated shear strain due to creep, shrinkage and temperature = $5x10^{-4}$ units. Draw the details of the bearing.

8. (a) What are the materials used for piers and abatements mention them.
   (b) Explain briefly about types of piers.
   (c) List out various types of forced acting on piers.

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