1st Semester Regular/Back Examination – 2015-16
BRIDGE ENGINEERING
BRANCHES: STRUCTURAL & FOUNDATION ENGINEERING/STRUCTURAL ENGINEERING

Time: 3 Hours
Max marks: 70
Q.CODE-T1209
Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1   Answer the following questions.   (2 x 10)

a)   For design of bridges in State highways, what type of IRC loadings is to be considered?

b)   State the values of A and B to calculate the impact factor for IRC class A loading, where $I = A/(B+L)$.

c)   The bridge deck of a slab culvert is designed as what type of slab?

d)   State the formula to calculate the distribution reinforcement for a bridge deck slab.

e)   For bridge deck slabs spanning in two directions, how the moments are computed?

f)   Draw the cross-section of a RCC box culvert with two cells showing various components.

g)   How the number of cells to be provided in a box culvert is decided?

h)   What type of bridge decks are preferred for long span prestressed concrete bridges?

i)   State two advantages of prestressed concrete bridges.

j)   Draw the c/s of a post tensioned trapezoidal box girder prestressed concrete bridge deck.

Q2   Explain about the various design parameters considered for bridge design. Draw a   (5+5)
      figure and show various components of a slab culvert.

Q3   Describe the various loading conditions considered for design of bridge   (5+5)
      superstructures in addition to the live loads. Sketch the loading arrangements for
      IRC class AA tracked loading system showing all the dimensions in both the
      directions.

Q4   Calculate the maximum design bending moment for a deck slab with clear span of   (10)
      5m, width of footpath of 80 cm n each side and wearing coat of 80 mm considering
      IRC Class AA tracked loading.

Q5   Design the top slab of a RCC box culvert of inside dimension 3.0m x3.0 m, if the   (7+3)
      positive B M at centre is 38 kNm, the negative B M at ends is 32 kNm and the
      direct axial compressive force is 12 kN. Show the reinforcement detailing.

Q6   For an interior panel of 3m by 5m, calculate the short span and long span bending   (10)
      moments if two wheels each of 57 kN (IRC Class A loading) are placed symmetrically
      with respect to the CG of the panel.

Q7   Calculate the minimum section modulus and minimum prestressing force required for a post
       tensioned prestressed concrete girder of clear span of 15 m assuming the data mentioned
      below.   (10)

      D L bending moment = 175 kNm, L L bending moment = 200 kNm, depth of the girder =
      600 mm, loss ration = 0.82, grade of concrete = M40, f_{ct} = 15 N/mm^2, f_{cw} = 12 N/mm^2,
      F_{tt} = F_{tw} = 0

Q8   Write short notes on the followings. (any two).   (5x2)

                  (a) Economic span of a bridge

                  (b) Load considerations for design of bridges

                  (c) Dispersion length

                  (d) Balanced cantilever bridge