Registration No: | | | | | | | | | | |

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M.TECH
CEPE101

1st Semester Regular/Back Examination – 2014
BRIDGE ENGINEERING
BRANCH(S): STRUCTURAL & FOUNDATION ENGINEERING,STRUCTURAL ENGINEERING

Time: 3 Hours
Max Marks: 70

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Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.
Use of relevant IS Codes and IRC Codes are allowed.

Q1 Answer the following questions. (2x10)

a) Draw the plan of an abutment with return wing wall.
b) Name the important substructure components of a bridge.
c) State the various types of foundations opted for bridge structures.
d) State the specifications for loads, vehicle length and track width for a tracked vehicle.
e) State the IRC empirical formula e for calculation of Impact factor for IRC Class A loading for RCC bridge and Steel bridge separately.
f) Draw the cross-section of a RCC box culvert with two openings showing the various components.
g) What do you mean by seismic load for a bridge structure? Write the equation to find out the lateral force due to earthquake loading for a bridge.
h) State various types of IRC loadings. As per usual practice, bridges on national highways are designed based on which IRC loading?
i) Why prestressing concept is preferred for long span bridge girders?
j) State the specific situations, where box culverts are preferred compared to other types of bridges.

Q2 Design the bottom slab of a RCC box culvert of inside dimension 3.5 m x3.5 m for the following data. The positive B M at centre is 50 kNm, the negative B M at ends is 40 kNm and the direct axial compressive force is 20 kN. Show the reinforcement detailing. (6+4)

Q3 Explain and sketch the loading arrangements for IRC class AA wheeled loadir g system showing the clear dimensions, load magnitude, contact area, etc in both the directions. (10)

Q4 Calculate the maximum live load and dead load shear force for a deck slab with clear span of 6m, width of footpath of 1m on each side, wearing coat of 100 mm. Asume IRC Class AA tracked loading. The road width is 7.5 m. (10)

Q5 For an interior panel of 3 m x4 m, find the short span and long span bending moments if two wheels are placed symmetrically with respect to the centre of thepanel. Consider IRC Class A loading. Sketch the panel with load positions. (10)

Q6 a) Calculate the effective length of load and effective width of dispersion for a class AA tracked vehicle using the following data. (6)
Depth of slab = 500 mm, wearing coat thickness = 60mm, span length = 5m, carriageway width = 10 m. Assume that, the vehicle is placed close to the kerb with the required minimum clearance of 1.2 mm. Footpath width = 1m. Draw neat sketches for the proper load positions

b) Explain the function of a cross-girder in a RCC bridge deck system. (4)

Q7 For a post tensioned prestressed concrete girder , a prestressing force of 5000 kN is to be applied. Design a Freyssinet multi cable system if there are 8 no of strands in each cable with applied effective pre stress of 1000 N/sq mm. Sketch the cable arrangement system for the central span section. Assume suitable girder cross-section. (10)

Q8 Write Short Notes

a) Typical Pre tensioned concrete girder bridge deck cross-section (3)
b) Effective width of dispersion for a deck slab spanning in one direction (3)
c) load condition cases for a box culvert (4)