

Registration No :

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Total Number of Pages: 02

M.Tech.  
CEPE101

1<sup>st</sup> Semester Back Examination 2017-18

BRIDGE ENGINEERING

BRANCH(S): STRUCTURAL & FOUNDATION ENGG, STRUCTURAL ENGG

Time: 3 Hours

Max Marks: 70

Q.CODE: B1059

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 : (2x10)
- a) State the structural components of a bridge separately for superstructure and sub structure.
  - b) Steel bridge at Howrah is what type of bridge?
  - c) Draw a figure to show linear waterway in a bridge provided over a stream or river.
  - d) State the various loading conditions considered for design of a box culvert. Draw the pressure diagrams for two different cases.
  - e) What is the prescribed minimum width of carriageway for a one lane bridge and for a two lane bridge? What should be the minimum width of footpath on either side of the carriageway for all bridges?
  - f) Quantify the magnitude of loading separately for tracked vehicle and wheeled vehicle for IRC Class 70R loading.
  - g) What are the various types of foundations provided for bridge piers and abutments?
  - h) Draw the cross-section of a RCC box culvert with two cells showing various components.
  - i) Why prestressing concept is preferred for long span bridges?
  - j) Draw a typical bridge cross section provided with precast pretensioned members.
- Q2** a) Explain the various factors to be considered for selection of an ideal bridge site. (6)  
b) What do you mean by a skew bridge? Explain the characteristics of a skew bridge. (4)
- Q3** A reinforced concrete box culvert has a clear ventway of 3.5 m by 3.5 m . The superimposed D.L. on culvert is 8 kN/sq m, L.L. on culvert is 15 kN/sq m. Angle of repose is 30 degree. Find the intensity of water pressure. Design the bottom slab for the following data. (10)  
Design moment at mid span of bottom slab = 75 kNm and tension = 10 kN. At support section, design moment = -60 kNm, axial compression = 25 kN. Use M25 concrete and Fe 415 steel. Show the reinforcement details.
- Q4** a) For an interior panel of 3m by 5m, find the short span and long span bending moments if two wheels each of 57 kN (IRC Class A loading) are placed symmetrically with respect to the CG of the panel. Show the calculations with detail step wise procedure. (7)  
b) State the limitations of Pigeaud's method for finding maximum moments on a bridge slab due to a concentrated load. (3)
- Q5** a) Describe the various loading conditions considered for design of bridge superstructures in addition to the live loads. (4)  
b) Sketch the loading arrangements for IRC class AA wheeled loading system showing all the dimensions in both the directions. (6)

- Q6** Calculate the maximum design bending moment for a deck slab with clear span of 5m, width of footpath of 75 cm on each side and wearing coat of 80 mm considering IRC Class AA tracked vehicle. **(10)**
- Q7** Find the minimum section modulus and minimum prestressing force required for a post tensioned prestressed concrete girder of clear span of 20 m assuming the data mentioned below. **(10)**  
D L bending moment = 200 kNm, L L bending moment = 270 kNm, depth of the girder = 750 mm, loss ration = 0.82, grade of concrete = M40,  $f_{ct} = 15 \text{ N/mm}^2$ ,  $f_{cw} = 12 \text{ N/mm}^2$ ,  $F_{tt} = F_{tw} = 0$
- Q8** **Write short notes on any TWO :** **(5 x 2)**
- a) Typical reinforcement details for the deck slab of a slab culvert
  - b) Components of a T beam bridge
  - c) Precast concrete pile and cast in situ pile
  - d) Balanced cantilever bridge