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CE 1818 PE 43

23/6/22

Roll No. of candidate | | | | | | | | | |

2022

B.Tech. 8th Semester End-Term Examination

CE

BRIDGE ENGINEERING

(New Regulation 2017-18)

(New Syllabus 2018-19)

Full Marks – 70 Time – Three hours

IS 456, IS 800, IRC 21 and Pigeaud's curves are allowed)

Assume any missing data.

The figures in the margin indicate full marks for the questions.

Answer question No. 1 and any *four* from the rest.

1. Fill in the blanks : (10 × 1 = 10)

   (a) Maximum impact factor for IRC class AA tracked vehicle is ————————

   (b) Courbon's method is applicable to the bridge design when there are at least ———— numbers of symmetrically spaced cross girders.

   (c) The total loading in case of IRC Class 70R wheeled vehicle is ————————

   (d) A bridge of span 25 m may be treated as ————————

   (e) The end supports of bridge structures are known as ————————

   (f) A bridge having its floor supported at the top of the super structure is called as ————————

   (g) For bridge span less than 9 m, IRC class AA and 70 R loading of wheeled vehicle, the provision for impact action is ———— percent.

   (h) Expansion bearing in bridge super structure allows ————————.

   (i) IRC class B loading is intended for the design of ———— bridge.

   (j) A bridge over a dry valley composed of series of span over trestle bend is called, as ————————.

[Turn over

2. (a) Discuss briefly the characteristics of an ideal bridge site for a bridge. (5)

(b) Explain the term linear waterway, afflux and depth of scour. (3)

(c) A bridge is proposed to be constructed across an alluvial stream having a discharge of 300 m^3/sec. Assuming value of silt factor as 1.0. Calculate the maximum scour depth when the bridge consists of : (7)

(i) Two span of 40 m each

(ii) Three span of 30 m each.

3. (a) Explain different types of loading and forces that are considered in designing road bridges and culverts. (4)

(b) Design a RC deck slab for a National Highway for the following particulars : (11)

Clear Span : 6 m
Carriage way : Two lane (7.5 m wide)
Width of footpath : 1 m on either side
Wearing coat : 80 mm
Grade of concrete : M25
Steel : Fe 415
Loading : IRC Class AA (Tracked) vehicle
Draw the cross section and longitudinal section showing the reinforcement detailing.

4. (a) Explain briefly the method of determining the live load bending moment in the girders of a T-beam and slab bridge deck using Courbon's method. (3)

(b) A slab panel of a RC T-beam and slab deck is 2.5 m wide between main girders and 4 m between cross girders. Calculate the value of long span and short span bending moments for IRC class A loading. Consider thickness of slab as 200 mm and wearing coat as 80 mm. Assume M25 Grade of concrete and Fe 415 steel. (12)

5. Design a longitudinal girder for an RCC T-beam bridge using the following data given : (15)

Effective span of the bridge: 16 m

Carriage way: Two lane (7.5 m wide)

Width of footpath: 1 m on either side

Wearing coat: 80 mm

Number of main girders = 3

Spacing of main girders = 2.5 m

Spacing of cross girders = 4 m

Grade of concrete: M25

Steel: Fe 415

Loading: IRC Class AA (Tracked)

Draw the cross section and longitudinal section of the girder showing the reinforcement detailing.

6. (a) What is the main function of a bearings? Explain the various types of bearing. (6)

(b) Design a mild steel rocker bearings for transmitting a vertical load 800 kN and horizontal reaction of 120 kN at the support of a girder bridge. Assume : (9)

Permissible compressive stress on concrete block = 4 MPa

Permissible flexural stress in steel plate = 160 MPa

Permissible bearing stress on steel plate = 185 MPa

Permissible shear stress in steel = 105 MPa.

7. (a) Briefly explain different types of piers used in highway bridge structures. (4)

(b) What are the different components of well foundation? Explain with a neat sketch. (4)

(c) The section of a stone masonry abutment used for a highway bridge together with the force acting per unit length of abutment is shown in figure below. Compute the stresses developed at the base and check for the stability of the abutment. Safe bearing capacity of the soil is 150 kN/m^2. Coefficient of friction between Masonry and soil is 0.5. Density of stone masonry is 25 kN/m^3. (7)