

Roll No.

23525

M. Tech. 3rd Semester Civil Engg.

(Specialisation in Structural Design)

(Elective-III) Examination – December, 2014

DESIGN OF BRIDGES

Paper : MTSD-308

Time : Three Hours]

[Maximum Marks : 100

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt any five questions. All questions carry equal marks. Assume suitable data. Use of IRC-18-2000, IRC : 21-2000 and IS : 456 code is allowed.

1. What are the Indian Roads Congress Bridge loading standards for different type of loadings ? Explain with neat sketch. 20
2. Design a R.C.C. Tee beam girder for a National highway bridge to suit the following data : 20
Clear width of roadway = 7.5 m,

Width of kerbs = 600mm, Effective span = 20m

Live load = I.R.C. Class AA tracked vehicle

Concrete = M20 grade, Steel = Fe-415 grade for steel

Spacing of cross girders = 4m,

Spacing of main girders = 2.5m

Design the deck slab, main girders and one of the cross girders, Using Courbon's method. Sketch the typical details of reinforcements.

3. A two span continuous reinforced concrete bridge with girders of variable cross section is required for a bridge, crossing, Design the deck slab and main girder to suit the following data : 20

Total length of bridge = 50m

Span length : two equal spans of 25m each

Width of carriage way = 7.5m

Kerbs = 600mm on either side, Footpaths = 1m on either side

Spacing of main girders = 3m, Spacing of cross girders = 5m

Concrete : M 20 grade; Steel : Fe 415 tor steel

Loading : IRC Class A or class AA whichever gives the worst effect

Design the bridge deck and draw typical sections showing reinforcements details in the deck slab and girder.

4. Design a double cantilever bridge to suit the following data : 20

Total Length of the bridge = 52m

Road width = 7.5m (two lane)

Footpaths = 1.5m on either side

Spacing of tee beams = 2m

Loading : IRC class AA tracked vehicle

Materials : M20 grade concrete, Fe 415 grade steel

Design the deck slab and one of the main girders and sketch the details of reinforcement.

5. Design a post tensioned prestressed concrete Tee beam and slab bridge deck to suit the following data :

20

Effective span = 24m

Width of carriage way = 7.5m

Kerbs 600mm wide on either side of the road

Spacing of main girder = 2m

Spacing of cross girders = 4m

Loading is IRC Class AA tracked vehicle

Adopt M 45 grade and high tensile steel strands confirming to IS : 6006 and supplementary reinforcement comprising Fe 415 steel HYSD Bars. Permissible stresses are as specified in IRC-18-2000 loss ratio = 0.85.

6. Explain the following terms in detail. $4 \times 5 = 20$
- (a) Diaphragms
 - (b) End block
 - (c) Short term deflections
 - (d) Check for diagonal tension
7. Design a reinforced concrete rocker bearing to transmit a support reaction of 800 kN. Adopt M 30 grade concrete and Fe 415 grade HYSD bars. Permissible bearing stress in concrete = 8N/mm^2 . Sketch the details of reinforcement in the concrete rocker bearing. 20
8. What are the different types of forces acting on the Piers ? What the general features of the piers ? How to do the stability analysis of piers. Explain with neat sketches. 20