

End Semester Examinations - 2015-16 Even Semester - May 2016

14CE3010 Advanced Bridge Engineering

Set B

Time : 3 hrs
Total Marks: 100

1. i) Distinguish 70R loading with Class AA loading 5 Marks
ii) A slab deck is to be designed for a T beam bridge crossing a major river in a National Highway.

The following data is available

Clear width of roadway - 7.5m

Footpaths - 1.5m on either side

Wearing coat - 100mm

No. of main girders - 4

Span (C/c of bearing) - 20m

Spacing of cross girder - 5m c/c

Loading - IRC Class AA tracked vehicle

M20 grade of concrete and Fe 415 grade steel is used

Design the deck slab only using Pigeaud's charts.

15 Marks

OR

2. i) Name the methods by which the distribution of live loads among the longitudinal girders of a T beam bridge can be estimated? 5 Mark
ii) Write about the all the details which an Engineer in-charge of the investigation in a bridge project has to carryout in implementing a bridge project. 15 Marks

3. i) When do you prefer T beam bridges and Prestressed concrete bridges? 5 Marks
ii) Design a post- tensioned prestressed concrete slab bridge for a national highway crossing for the following data:

Effective span – 10m

Equivalent live load – 15 kN/m

Materials – M40 grade concrete and

7mm diameter high tensile wires with an ultimate tensile strength of 1500 N/mm²

Cube compressive strength of concrete at transfer, $f_{ci} = 35 \text{ N/mm}^2$

Loss ratio = 0.8

Design the slab

15 Marks

OR

4. i) State the codal norms of design of an end block of a prestressed concrete T beam bridge 5 Marks
ii) Design a suitable section for the longitudinal girder of a post tensioned prestressed concrete T Beam Bridge for a

National Highway crossing to suit the following data:

Effective span	- 20m
Width of road	- 7.5m
Kerbs	- 600mm on each side
Thickness of wearing coat	- 80mm
Thickness of deck slab	- 250mm
Live load	- IRC Class AA tracked vehicle

Adopt M50 grade of concrete with cube strength at transfer as 45 N/mm^2 .

Loss ratio – 0.8

Spacing of cross girder – 5m c/c

Ultimate tensile strength of 7mm high tensile wires – 1500 N/mm^2 15 Marks

5. i) What is called as Tower of a Cable Stayed Bridge and state its functions 5 Marks

ii) The effective span of a through type plate girder two lane highway bridge is 24m. The reinforced concrete slab is 250mm thick inclusive of the wearing coat. The footpaths are provided on both the sides of the carriageway. The cross girders are provided at 3m c/c. The stringers are spaced at 2.45m c/c. The spacing between main girders is 13m. Design the maximum section of the plate girder, if the bridge is to carry IRC class A standard load.

15 Marks

OR

6.

i) Why do we design the mid-span section of a trussed girder bridge? 5 Marks

ii) Explain the procedure of analysis and design of a trussed girder bridge with a typical example. 15 Marks

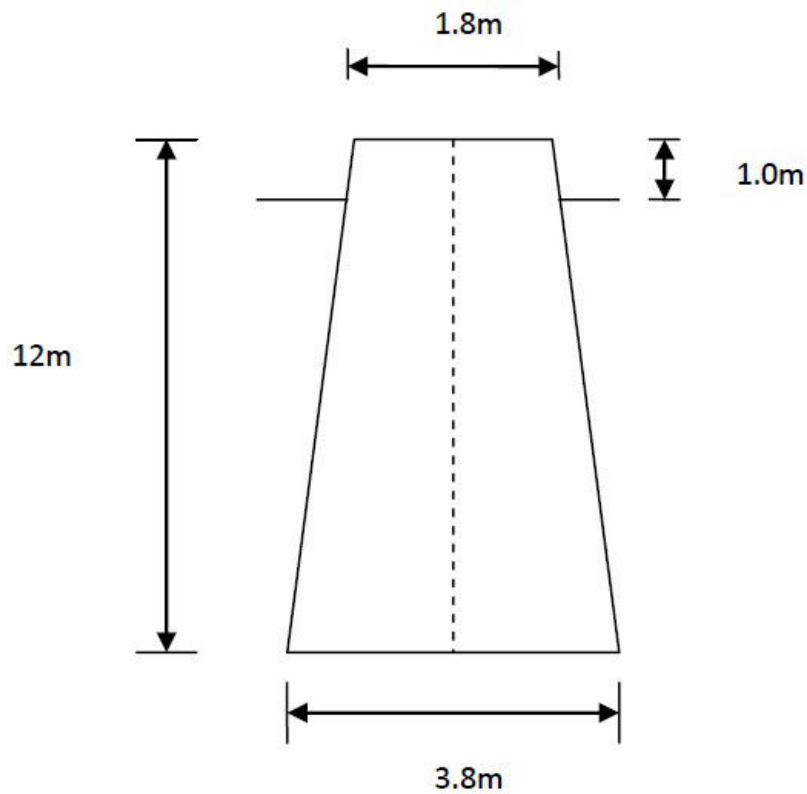
7. i) Enumerate the different types of piers adopted in bridges. 5 Marks

ii) Verify the adequacy of the dimensions for the pier as shown in Fig.1. The following details are available.

Top width of the pier	= 1.8m
Height of the pier upto springing level	= 12m
C/c of bearings on either side	= 1.00m
Side batter	= 1 in 10
High flood level	= 1m below bearing level
Span of the bridge	= 16m
Loading on span	= IRC Class AA
Road: Two-lane road with 1m wide foot path on either side	

Super Structure: Consists of three longitudinal girders of 1.3m depth with a Deck slab of 200mm depth. Rib width of girders = 300mm.

Material of the pier = Concrete M20



15 Marks

OR

8. i) Briefly explain the types of expansion joints 5 Marks
 ii) Classify the bearings according to their purpose and stating their advantages and disadvantages. 15 Marks
9. A well foundation is to be designed for an abutment of 10m x 5m base dimensions. The well is founded on a sandy soil. The data available are as follows:
 Height of bearing above maximum scour level: 28m
 Permissible horizontal displacement of the bearing level is 50mm
 Height of the abutment = 6.0m
 Total vertical load including weight of the abutment and well (considering buoyancy effect) = 20,000kN
 Total lateral load at the scour level = 400kN
 Submerged unit weight of soil = 9.5 kN/m^3 . Assume the soil as sandy soil. 20 Marks

Wishing you All the Best
