

IV B.Tech. I Semester Regular Examinations, November -2005
BRIDGE ENGINEERING
(Civil Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) What are the loads to consider while designing the road bridges and culverts.
(b) Draw clearance diagram for high way traffic (Single lane Bridge and multiple lane bridge)
(c) Explain centrifugal force effect on a curve of road. [4+6+6]
2. Write short notes on the following:
(a) Aesthetics of bridge design
(b) Bridge lightning
(c) Kerbs
(d) Sunken and elevated roads. [4+4+4+4]
3. (a) In what circumstances the skew slab culverts are adopted.
(b) Give the reinforcement details in skew slab culvert (Plan at bottom and top).
(c) At what exceedence of angle, the rigorous analysis is desirable in skew slab culverts. [4+6+6]
4. Design a reinforced concrete box culvert with inside dimensions of 3m height and 4.5m width. The box culvert has to carry a super imposed dead load of $10 \text{ KN}/m^2$ and a live load of $50 \text{ KN}/m^2$. The density of the earth is $18 \text{ KN}/m^3$. Angle of repose of soil is 30° . Adopt M-20 grade concrete and Fe-415 grade steel. Sketch the details of reinforcement in the box culvert.
5. (a) What do you understand by balanced cantilever bridge.
(b) What are the component parts in balanced cantilever bridge and explain them.
(c) What are the advantages of balanced cantilever design over simply supported girder design. [4+6+6]
6. Design a R.C.C Tee beam girder deck for a bridge crossing using the following data:
Clear width of road way = 7.5m, width of kerbs = 600mm
Effective span = 18m
Footpaths one metre on either side
Live load = I.R.C Class - AA
Thickness of wearing coat = 100mm, Number of main girders = 4
Adopt M-20 grade concrete and Fe-415 grade steel
Spacings of cross girders = 4m, spacing of main girders = 2.5m
Design the deck slab and main girder using Courbon's method. Sketch the typical details of reinforcement in the slabs and beams. [16]

7. (a)) What is pier and bed block or Abutment cap?
 (b) How many types of piers are there and describe them with neat sketches?
 [8+8]
8. Check the adequacy of the dimension for pier with given data Shown in Figure 1

superstructure: simply supported T-beams of 20m span

foundation : well foundation

Dead load from each span = 2250KN

Reaction due to live load on one span = 900 KN

Maximum mean velocity of current = 3.6m/sec

Material to be adopted M20 grade concrete and Fe415 steel

Live load IRC class AA

[16]

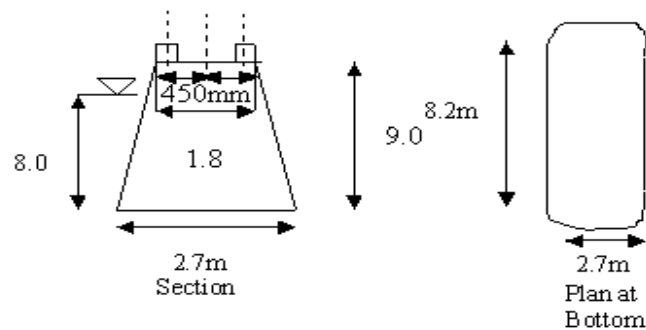


Figure 1:

IV B.Tech. I Semester Regular Examinations, November -2005
BRIDGE ENGINEERING
(Civil Engineering)

Time: 3 hours**Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

1. (a) What are the four standard types of live loads consider in the code. Explain them in detail.
(b) Explain impact effect for IRC class A or B loading and for IRC class AA OR 76R loading. [8+8]
2. Write short notes on the following.
 - (a) Temperature stresses
 - (b) Stress during service
 - (c) Bearing stresses behind anchorages
 - (d) Permissible stresses in pre-stressing steel. [4+4+4+4]
3. (a) Give the classification of culverts based on construction of structures.
(b) What are the component parts in concrete slab culvert and explain them briefly.
(c) Give expression to calculate the effective width of dispersion for single concentrated load as per IS 456-2000. [4+6+6]
4. Design the box culvert with the following data
Inside diameter $2.5\text{m} \times 3.0\text{m}$
Live load IRC class AA (tracked)
Density of soil $16 \text{ KN}/\text{m}^3$
Angle of Repose 30°
Type of road - one lane
Height of embankment above the box = 1.2m
Use M30 grade concrete and Fe415 steel
Type of stream: Non perennial. [16]
5. (a) What is meant by “Articulation”. What is the advantage of Articulation provision in balanced cantilever bridge.
(b) Give the general arrangement of bridge with counter - weight cantilevers.
(c) Express the formula for calculation of the “ Shear” in bridges (cross-section changes from point to point). [6+6+4]
6. An R.C.C TEE beam and slab girder deck is required for the crossings of a national highway. The data available is as follows.
Clear width of road way = 15m, Footpaths - one metre on either side

Effective span = 20m, Thickness of wearing coat = 100mm

Live load = I.R.C Class - AA

Number of main girders = 8

Adopt M-20 grade concrete and Fe-415 grade steel

Spacing of cross girders = 4m, spacing of main girders = 2.0m

Design one of the interior panels of deck slabs and one of the exterior girders and sketch the details of reinforcements. [16]

7. (a) What is the difference between pier and abutment?
 (b) What type of loads and forces are considered in the design of pier? [8+8]
8. The figure 2. shows the section of a stone masonry abutment used for a highway . bridge together with the forces acting per unit length of the abutment
 Safe bearing capacity of soil $150 \text{ KN}/\text{m}^2$
 Coefficient of friction between masonry and soil = 0.5
 Density of stone masonry = $25 \text{ KN}/\text{m}^3$
 Compute the stresses developed at the base and check for the stability of the abutment. [16]

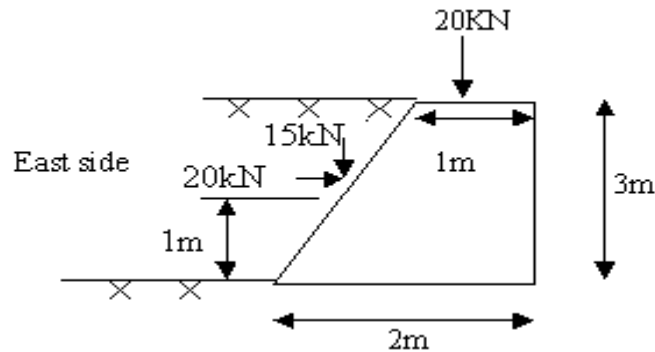


Figure 2:

IV B.Tech. I Semester Regular Examinations, November -2005
BRIDGE ENGINEERING
(Civil Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) What do you understand by width of carriage way.
(b) What are the loads consider while designing the bridges.
(c) Explain horizontal forces due to water current on bridges. [4+6+6]
2. Write short notes on the following:
(a) Bond, Anchorage and splice
(b) Cover to reinforcement
(c) Minimum reinforcements in slabs and beams
(d) Concreting operations. [4+4+4+4]
3. Design the box culvert with the following data
Inside diameter 3.5m \times 3.5m
Live load IRC class A
Density of soil 18 KN/ m^3
Angle of Repose 30°
Use M25 grade concrete and Fe415 steel. [16]
4. (a) In what circumstances the skew slab culverts are adopted.
(b) Give the reinforcement details in skew slab culvert (Plan at bottom and top).
(c) At what exceedence of angle, the rigorous analysis is desirable in skew slab culverts. [4+6+6]
5. (a) Give the sketches of continuous reinforced bridges.
(b) What are the advantages of continuous girder bridges over the simply supported girder bridges. [8+8]
6. Design a R.C.C Tee beam and slab bridge deck to suit the following data.
Effective span = 16m
Footpaths one metre on either side
Live load = I.R.C Class AA tracked vehicle
Thickness of wearing coat = 80mm
Number of main girders = 4
Spacing of cross girders = 4m, spacing of main girders = 2.0m
Adopt M-20 grade concrete and Fe-415 grade steel
Design the deck slab, exterior girder and cross girder using Courbon's method of load distribution. Sketch the typical details of reinforcement in the slabs and beams. [16]

7. Check the adequacy of the dimension for pier with given data Shown in Figure 3

superstructure: simply supported T-beams of 20m span

foundation : well foundation

Dead load from each span = 2250KN

Reaction due to live load on one span = 900 KN

Maximum mean velocity of current = 3.6m/sec

Material to be adopted M20 grade concrete and Fe415 steel

Live load IRC class AA

[16]

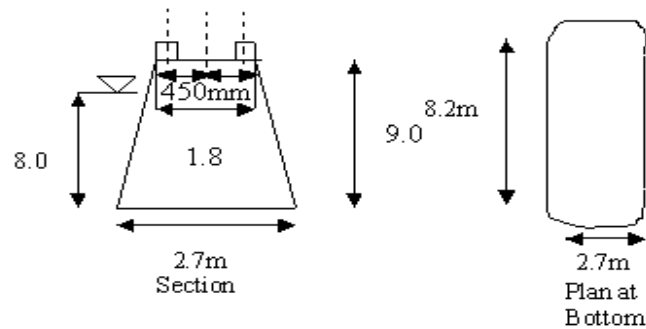


Figure 3:

8. (a) List out the forces and loads considered in the design of a pier.
 (b) Explain in detail about the forces due to wave action and collision. [8+8]

IV B.Tech. I Semester Regular Examinations, November -2005
BRIDGE ENGINEERING
(Civil Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) What are the loads to consider while designing the bridges.
(b) Explain the Earth pressure in detail.
(c) Explain the Buoyancy effect. [4+6+6]
2. Write short notes on the following:
(a) Requirements to obtain a good design bridge structure
(b) Concrete grade for a bridge structure and its stresses
(c) Elastic design coefficients
(d) Curtailment of bars. [4+4+4+4]
3. (a) In which situations the pipe and box culverts are preferable.
(b) What are the design loads considered while designing the box culvert. [8+8]
4. A reinforced concrete box culvert of rectangular water way 3.75 m wide by 2.5 m deep is required for a road crossing. The box culvert has to support a superimposed dead load of 10 KN/m^2 and a live load of 40 KN/m^2 . The density of the earth is 16 KN/m^3 . Angle of repose of soil is 30° . Adopt M-25 grade concrete and Fe-415 grade steel. Sketch the details of reinforcement in the box culvert. [16]
5. (a) What are the general provisions for cantilever bridge to select the spans and profile at girders.
(b) What are the disadvantages at continuous girder bridges over the simply supported girder bridges. [8+8]
6. Design a R.C.C Tee beam girder for a national highway bridge to suit the following data:
Clear width of road way = 7.5m, width of kerbs = 600mm
Effective span = 20m
Live load = I.R.C Class - AA tracked vehicle
Thickness of wearing coat = 80mm, Number of main girders = 4
Adopt M-20 grade concrete and Fe-415 grade steel
Spacings of cross girders = 4m, spacing of main girders = 2.5m
Design the deck slab and main girder using Courbon's method. Sketch the typical details of reinforcement. [16]

7. The figure 4. shows the section of a stone masonry abutment used for a highway . bridge together with the forces acting per unit length of the abutment
 Safe bearing capacity of soil $150 \text{ KN}/m^2$
 Coefficient of friction between masonry and soil $= 0.5$
 Density of stone masonry $= 25 \text{ KN}/m^3$
 Compute the stresses developed at the base and check for the stability of the abutment. [16]

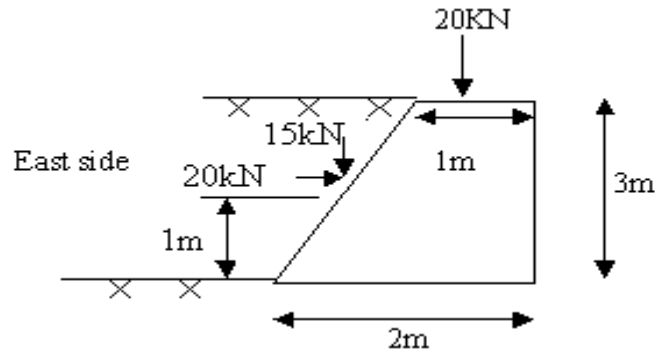


Figure 4:

8. (a) What is Abutment and give typical reinforced concrete abutment?
 (b) What are the forces considered while designing the abutment? [8+8]
