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23525

M. Tech. 3rd Sem. Civil Engineering (Specialisation in Structural Design) (Elective-III) Examination– December, 2016

DESIGN OF BRIDGES

Paper : MTSD-308

Time : 3 hours ***Max. 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 the examination.

Note: Attempt any **five** questions.

1. (a) Classify all types of bridges. Explain why site investigation is necessary before start of a bridge project. (10)

(b) Write down the general design considerations for the design of bridges. (10)

2. Design a slab culvert for the following data : (20)

Culvert to be on state highway,

width of the bridge 11m ;

no footpath provided ;

condition of expose moderate ;

clear span 6 m ;

height of vent 3 m ;

depth of foundation 1.4 m wearing course 80 mm thick asphlatic concrete ;

concrete M 35 ;

steel used is Fe 500.

Live load is considered due to class AA tracked vehicle.

3. Design a double cantilever bridge to suit the following data : (20)

Total length of the bridge = 52 m

Road width = 7.5 m (Two lane)

Footpaths = 1.5 m on either side

Spacing of beams = 2 m

Loading : IRC class AA tracked vehicle

Material : M-35 grade of concrete and Fe 500 grade of steel

Design the salient structural elements of the bridge and sketch the details of reinforcement.

4. What are the different types of Box Girder Bridges ? Explain and draw neat and clean sketches for all. (20)

5. Design a prestressed concrete slab for the following data : (20)

Span (clear) : 4.5 m

Live Load : IRC class 70 R

Road : National Highway

Foot Path : 1 m on either side

Material : M 40 concrete and Fe 500 grade of steel

The compressive stress permissible in concrete during transfer : 16 Mpa.

6. Explain the following in detail : (20)

(a) Short term deflections

(b) What are the checks for stresses at various sections ?

(c) Long term deflections.

7. Design of Pier for following data : (20)

Preliminary Dimension : Assumed as in Figure

Super-Structure : Simply supported T-beam of 21.3 m span

Foundation : Well Foundation

Dead Load from each span : 2,500 kN

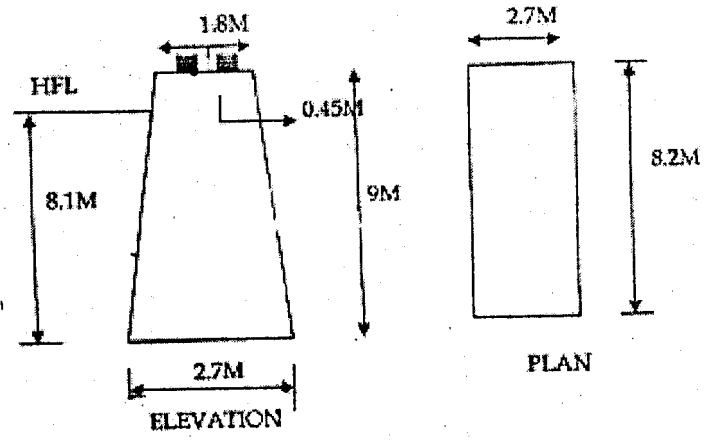
Reaction due to LL on one span : 950 kN

Maximum velocity of current : 4 m/sec

Material for pier : Cement Conc. M 35 grade

L.L. IRC Class AA

Only the straight portion of the pier will be considered in design.



8. A reaction of 3,000 kN is expected at the supports of a 20 m span T-beam bridge.

Design a rocker and roller bearing . The other details are : (20)

Allowable pressure on roller = 5N/mm dia/mm length

Allowable pressure on bearing plates = 2,500 N/mm^2

Bearing pressure on rocker pin = 25 N/mm^2

Allowable pressure on concrete bed block = 3.8 N/mm^2.