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23525

M.Tech 3rd Semester Civil Engg. (Specialization in Structural Design) (Elective-III) Examination–May, 2014

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 : Assume any suitable data if missing. Attempt any **five** full questions. All questions carry equal marks. Use of relevant IS code is allowed.

1. Design a reinforced concrete abutment using following data : 20

Dimensions : shown in Fig a

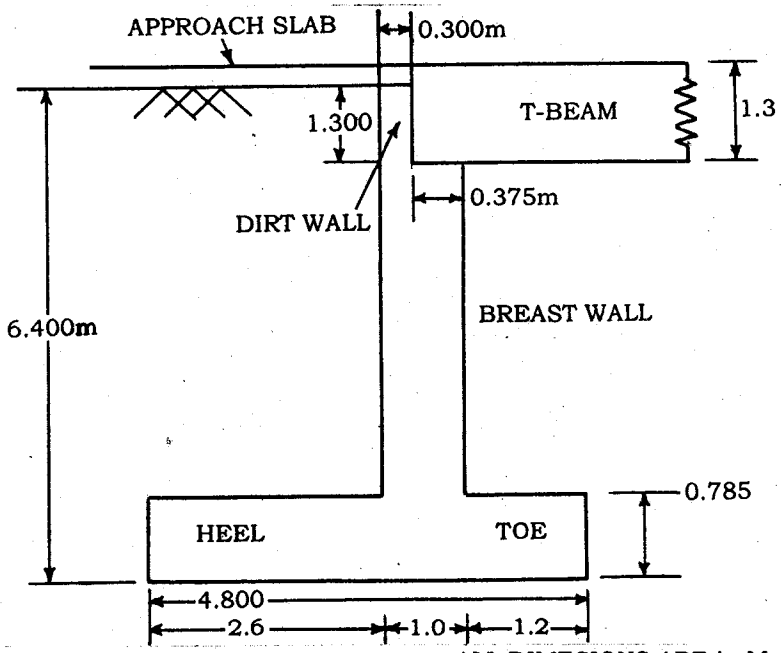
Superstructure : T-beam two-lane bridge of effective span 16.1 m.

Overall length : 17.26

Loading : As for National Highway

Back fill : Gravel with angle of repose $\phi = 35°$

Unit weight of back fill $W = 18kN/m^2$



ALL DIMESIONS ARE in M.

2. (a) Design the longitudinal girder of a T-beam and slab bridge for the following data. Effective span 18 m, carriage way width 7.5 m, Kerb 600 mm on either side. Provide three longitudinal beams and five cross beams. Loading IRC class AA tracked vehicle. Adopt M25 Fe415 bars. Also provide the reinforcement details. Use Courbon's method for the calculation of reaction coefficients. 10

(b) What is Courbons method ? List the assumptions and limitations of this method. 10

3. (a) Explain the various components of a bridge. 10

(b) Briefly discuss the economic span for bridges. 10

4. Write short notes on any **four** : 20

(a) Pigeaud's curve

(b) Parameters influencing 'Impact Factors'

(c) Hendry-Jaegur method

(d) Typical cross section of post-tensioned pre-stress concrete bridge deck with advantages.

(e) Secondary stresses in the truss bridges.

5. Design a RC slab culvert for a clear span of 8m and a carriageway of 10m. Kerb on either side is 350 mm. Assume uniform slab thickness of 650 mm and a wearing coat of 75 mm thick. Kerb details need not be designed. Sketch the reinforcement details in the slab. Consider single train of IRC Class AA tracked vehicle loading. 20

6. A reinforced concrete simply supported slab is required for the deck of a road bridge having the following data : 20

(i) clear span = 5.5 m.

(ii) width of carriage way = 7.5 m.

(iii) footpath on either side = 1 m wide

(iv) Materials = M20 grade concrete and Fe 415 steel.

(v) Type of loading IRC class AA.
Design the deck slab. Show the reinforcement details.

7. Design a post tensioned pre-stressed concrete bridge for following data : 20

(i) Effective span = 20 m

(ii) Width of road = 7.5 m

(iii) Kerbs = 600 mm on each side

(iv) LL = IRC 70 R tracked vehicle

(v) Use fck = 20 MPa for deck slab and fck = 50 MPa for beam.

(vi) fci = 35 MPa, fct = 17.5 MPa, fcw = 16.5 MPa and Ec = 34,000 MPa

(vii) Loss ratio = 0.85, use 8mm diameter wire, having fp = 1500 MPa.

(viii) Spacing between main girder 2.5 m and no of main girder = 3
Assume 250 mm thickness of deck slab and 80 mm thick wearing coat.

8. Write short notes : (any **four**) 20

(a) Guidelines to control cracking as per IRC 21

(b) Courborn's method

(c) Advantages of prestressed concrete bridges

(d) Economical span length of bridge

(e) Support arrangement in balanced cantilever bridges.
