

First Semester M. E. (Civil Engg.) (Transpo. Engg. and Management) Examination

DESIGN OF BRIDGES

(Elective – I)

Paper – 1 SFTR 5

P. Pages : 3

Time : Three Hours]

[Max. Marks : 80

- Note :** (1) All questions carry equal marks.
 (2) Due credit will be given to neatness and adequate dimensions.
 (3) Assume suitable data wherever necessary.
 (4) Illustrate your answer wherever necessary with the help of neat sketches.
 (5) Solve any **five** questions.
 (6) Use pen of Blue/Black ink/refill only for writing the answer book.

1. (a) Explain principles of planning of elevated rail transit system. 6
 (b) Explain the following terms :—
 (i) Pedestrian crossing.
 (ii) Sub-ways. 6
 (c) Define impact factor. What parameters influence it ? 4
2. Design a reinforced concrete slab culvert for a National Highway crossing to suit the following data :—
 Carriage way – Two lane (7.5 m wide)
 Foot path – 1 m on either side
 Clear span – 6 m.
 Wearing coat – 80 mm
 Width of bearing – 400 mm
 Materials – M-25 Grade concrete and
 Fe – 415 Grade HYSD bars.
 Loading – IRC class AA tracked vehicle.

Design the reinforced concrete slab deck and sketch the details of reinforcement in the longitudinal and cross section of the slab. 16

3. Design a reinforced concrete T-beam bridge for carrying a two lane traffic :--
- (i) Effective span - 15 m
 - (ii) Width of carriage way - 7.5 m.
 - (iii) Thickness of wearing coat - 80 mm.
 - (iv) Live load -- IRC class 'A' loading.
 - (v) Material -- M-30 concrete and Fe-415 steel.
 - (vi) Spacing of cross girders -- 3 m.

Sketch the reinforcement details in the component parts of deck.

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4. Design a reinforced concrete box culvert having a clear ventway of 3 m x 3 m. The superimposed dead load on the culvert is 12.8 kg/m^2 . The live load on the culvert is 50 kg/m^2 . Density of soil at site is 18 kg/m^3 . Angle of repose = 30° . Adopt M-20 Grade concrete mix and Fe-415 grade steel. Sketch the details of reinforcement in the box culvert.

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5. Design post tensioned prestressed concrete deck slab for the following data :--

- (i) Clear span - 10 m.
- (ii) Clear width of roadway - 7.0 m.
- (iii) Foot path - 1 m wide on either side.
- (iv) Thickness of wearing coat - 100 mm.
- (v) Live load-IRC class - A tracked vehicle.
- (vi) Type of structure - Class - I
- (vii) Materials - M - 50 Grade concrete and
7 mm diameter high strength
Strands with ultimate tensile
Strength at 1500 MPa. The cable
Consists of 12 strands anchored at
the end with a suitable diameter anchor block.
- (viii) Compressive strength of concrete at
transfer (f_{ci}) - 40 MPa.

Sketch the reinforcement details.

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6. (a) Explain general features and structural component of abutments. 4
- (b) Verify the adequacy of the dimensions for the piers. The following detail are available.
- (i) Top width of the pier = 2 m.

(ii) Height of the pier upto = 10 m.

Springing level

(iii) C/C of bearing on either side = 1.0 m.

(iv) Side batter – 1 in 12.

(v) High flood level = 1.0 m below the bearing level.

(vi) Span of the bridge = 20 m.

(vii) Loading on span = IRC class AA.

(viii) Road – Two lane road with 1 m wide
footpath on either side.

(ix) Superstructure – Consists of three
longitudinal girders of 1.4 m depth with a deck slab of 200 mm depth.
Rib width of girders = 400 mm.

(x) Material of pier – Concrete – M-30.

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