

00961

No. of Printed Pages : 3

BICEE-010

B.Tech. CIVIL ENGINEERING (BTCLEVI)

Term-End Examination

December, 2015

BICEE-010 : ANALYSIS AND DESIGN OF BRIDGES

Time : 3 hours

Maximum Marks : 70

Note : Attempt any five questions. All questions carry equal marks. Assume any missing data suitably. Use of scientific calculator and relevant IS code is permitted.

1. Design the longitudinal girder of T-beam and slab bridge for the following data : 14

Effective span = 18 m

Carriageway width = 7.5 m

Kerbs = 600 mm on either side

Provide 3 longitudinal beams and 5 cross beam loading

Consider IRC Class AA tracked vehicle loading

Use M 20 and Fe 415 bars.

Use Courbon's method for calculation of reaction coefficients.

2. (a) Explain the purpose of providing expansion joints in bridges. Explain the various types of expansion joints. 10
- (b) What is the function of bearings in bridges ? 4
3. (a) Define balanced cantilever bridge. Also give the advantage of balanced cantilever design over simply supported girder design. 10
- (b) Determine the waterway for a bridge across a stream with a flood discharge of $225 \text{ m}^3/\text{s}$, velocity 1.5 m/s and width of flow at high flood level 60 m , if the allowable velocity under the bridge is 1.8 m/s . 4
4. (a) Explain briefly the principles of design of the following elements of a prestressed concrete bridge : 10
- (i) Mid-span section of girder
- (ii) End block of girder
- (iii) Deck slab in 'gap slab' type of deck
- (b) What is meant by 'economical span' of a bridge ? Distinguish between vertical clearance and free board. 4
5. (a) Explain with sketches the component parts and structural action of truss bridge, cable stayed bridges and suspension bridge. 10
- (b) What are the characteristics of an ideal site for a major bridge across a river ? 4

6. Design a post-tensioned concrete slab bridge deck for a national highway crossing to suit the following data :

14

Clear span = 5.5 m

Width of bearing = 400 mm

Clear width of roadway = 7.5 m

Footpath on either side = 1 m

Kerbs = 600 mm wide

Thickness of wearing coat = 80 mm.

Consider LL = IRC class AA tracked vehicle, Type of structure = Class I type, Use M 20 and 7 mm ϕ wire with ultimate strength = 1500 N/mm², Loss ratio = 0.8.

7. Write short notes on any *two* of the following :

2×7=14

- (a) Box culvert
- (b) IRC loading standards for highway bridges
- (c) Calculation of impact factor for highway bridges.