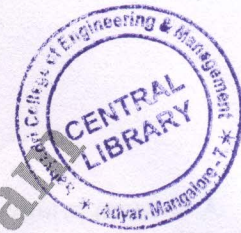


# CBCS SCHEME



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15CV741

Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020

## Design of Bridges

Time: 3 hrs.

Max. Marks: 80

- Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. Use of codes IRC-6, IRC-21, IRC-112, IS-456, SP-16 and Pigeaud's curves are permitted.*

### Module-1

- 1 a. Classify bridges based on various parameters. (10 Marks)  
b. What are the different types of loads acting on a bridge? (06 Marks)

OR

- 2 a. What is meant by economic span? Derive the expression for economic span. (08 Marks)  
b. Determine the linear waterway for a bridge across a stream with a flood discharge of  $200 \text{ m}^3/\text{s}$ , velocity  $1.4 \text{ m/s}$  and width of flow at high flood level  $52.0 \text{ m}$ , if the allowable velocity under the bridge is  $1.75 \text{ m/s}$ . (08 Marks)

### Module-2

- 3 A reinforced concrete slab bridge has a clear span of  $5.5 \text{ m}$  and has the following data:  
Width of bearing on either side =  $500 \text{ mm}$   
Clear width of carriage way =  $7.5 \text{ m}$   
Width of footpath on either side =  $1.0 \text{ m}$   
Wearing coat thickness =  $80 \text{ mm}$   
Live load expected – Class AA tracked vehicle  
Grade of concrete = M30  
Grade of Steel = Fe 415  
Design and detail the slab bridge. (16 Marks)

OR

- 4 a. What is meant by a skew slab bridge? (02 Marks)  
b. What are the differences between a straight slab bridge and a skew slab bridge? (06 Marks)  
c. Sketch typical reinforcement detailing of skew slab bridges. (08 Marks)

### Module-3

- 5 Design and detail the interior slab of a T-beam bridge with the following data:  
Spacing of longitudinal main girders =  $3.0 \text{ m}$   
Spacing of cross girders =  $3.75 \text{ m}$   
Thickness of deck slab =  $200 \text{ mm}$   
Thickness of wearing coat =  $80 \text{ mm}$   
Live load = Class AA, tracked vehicle  
Grade of concrete = M30  
Grade of steel = Fe415 (16 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg,  $42+8 = 50$ , will be treated as malpractice.



OR

- 6 A T-beam bridge has the following data:  
 Effective span = 16.0 m  
 Clear carriage way = 7.5 m  
 Longitudinal main girders = 3 Nos@2.5m c/c  
 Cross girders = 5 Nos@4.0 m c/c  
 Kerbs at both the ends = 600 mm wide  
   300 mm deep.  
 Thickness of deck slab = 200 mm  
 Thickness of wearing coat = 80 mm  
 Live load – class AA tracked vehicle  
 Grade of concrete – M30  
 Grade of steel – Fe415  
 Design and detail the outer main girder of the T-beam bridge. (16 Marks)

**Module-4**

- 7 A single vent box culvert has internal dimensions 3.0m × 3.0m with the following data:  
 Superimposed dead load = 16.0 kN/m<sup>2</sup>  
 Live load including impact = 52.0 kN/m<sup>2</sup>  
 Insitu intensity of soil = 18.0 kN/m<sup>3</sup>  
 Angle of internal friction = 30 degrees  
 Considering empty condition, Design and detail the box culvert using M30 Grade concrete and Fe 415 grade steel. (16 Marks)

OR

- 8 Design and detail a pipe culvert for the following data:  
 Catchment area = 12.0 sq. km  
 Maximum daily rainfall = 25 mm  
 Runoff coefficient = 0.8  
 Clear road width = 7.5 m  
 Footpath on either side = 600 mm  
 Bed level of stream = 50.0 m  
 Road formation level = 53.0 m  
 Weight of earthfill = 74 kN/m  
 Influence coefficient  $C_s = 0.036$   
 Impact factor = 1.5  
 Loading – Class A vehicle with 114 kN use NP<sub>3</sub> pipes with longitudinal reinforcement 3.55 kg/m, spiral reinforcement 46.21 kg/m and a 3 Edge bearing strength of 100.6 kN/m. (16 Marks)

**Module-5**

- 9 a. What are the forces acting on piers? (04 Marks)  
 b. Sketch typical types of piers used in bridges. (06 Marks)  
 c. Write short notes on stability of abutments. (06 Marks)

OR

- 10 a. With neat sketches, explain different types of bearings used in bridges. (10 Marks)  
 b. Explain why expansion joints are required on bridge deck slabs. (04 Marks)  
 c. Detail a typical expansion joint in the deck slab of a concrete bridge. (02 Marks)

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