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 m^3/s, velocity 1.4 m/s and width of flow at high flood level 52.0m, if the allowable velocity under the bridge is 1.75 m/s. **(08 Marks)**

Module-2

3 A reinforced concrete slab bridge has a clear span of 5.5m and has the following data:
Width of bearing on either side = 500 mm
Clear width of carriage way = 7.5 m
Width of footpath on either side = 1.0 m
Wearing coat thickness = 80 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 m
Spacing of cross girders = 3.75 m
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 **(16 Marks)**

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^2
Live load including impact = 52.0 kN/m^2
Insitu intensity of soil = 18.0 kN/m^3
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_3 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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