CBCS SCHEME

15CV741

USN | | | | | | | | | |

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
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 IRC-6, IRC-21, IRC-112, IS458-1988 is permitted.
3. Missing data may be assumed suitably.

Module-1

1 a. Briefly explain the following term related to bridge engineering atleast with one relevant formula for each.
  (i) Afflux   (ii) Scour **(06 Marks)**
  b. Derive the condition of Economic Span of bridge. **(10 Marks)**

OR

2 a. What is impact factor, briefly explain the impact allowances in IRC class A loading. **(06 Marks)**
  b. Determine the waterway for the bridge across a stream with flood discharge of 225 m^3/s, velocity 1.5 m/s and width of flow at high level in 60m, the allowable velocity under the bridge is 1.8 m/s. **(10 Marks)**

Module-2

3 Design a reinforced concrete slab culvert for national highway over a stream crosses a road at an angle of 90°. The design datas are as follows:
Carriage way (two lane) = 7.5 m
Footpath = 1m on Either side
Clear span = 6m
Wearing coat = 80mm
Width of bearing = 400mm
Material : M_{25} grade concrete and Fe-415, HYSD Bars
Loading : IRC class AA tracked vehicle. **(16 Marks)**

OR

4 Design the Skew slab culvert to suit the following data:
Clear span = 6 m, Skew angle = 10°, Width of carriage way = (Two lane) = 7.5 m
Wearing coat = 80 mm , Width of bearing = 400mm.
Material : M_{25} grade concrete, Fe 415 HYSD Bars
Loading : IRC class AA tracked vehicle. **(16 Marks)**

Module-3

5 Design the cantilever slab of 'T' beam bridge for the following data:
Width of road way = 7.5m
Width of kerb = 0.6m
Depth of kerb = 0.3m
No. of longitudinal girder = 3
Spacing of longitudinal girder = 2.5m
Thickness of wearing coat = 80mm
Type of loading : IRC class A wheel load
Materials : M_{20} grade concrete, Fe-415 HYSD Bars. **(16 Marks)**

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OR

6 Design the longitudinal girder of the 'T' beam bridge for following data by using Courbon's method for reaction factor:

Number of longitudinal girder = 3

Spacing of longitudinal girder = 3 m

Spacing of cross girders = 3.5m

Loading from cantilever portion from two sides = 31.32 kN.

Loading from deck = 41.32 kN

Span of the bridge = 14 m

Material : M_{40} grade concrete, Fe 415 Steel

Loading : IRC class AA tracked vehicle. **(16 Marks)**

Module-4

7 Design a box culvert having inside dimension of 3m × 3m. This culvert is subjected to a dead load of 14000 N/m^2 and live load of IRC-class AA tracked vehicle. Assume the unit weight of the soil to be 18000 N/m^3, the angle of repose of the soil is 30°C. The culvert is to be designed for particular case when dead load and live load acting from outside while no water pressure inside. The width of road is 7.5m and span is 3.3m. Use M_{25} grade concrete and Fe-415 HYSD Bars. **(16 Marks)**

OR

8 Design a pipe culvert through a road embankment of height 6m. The width of road is 7.5m and the formation width is 10m. The side slope of the embankment is 1.5:1. The maximum discharge is 5 m^3/s. The safe velocity is 3 m/s. Assume bellmouth entry. Consider loading as IRC-class AA tracked vehicle. Given C_e = 1.5, C_s = 0.010 and unit weight of soil is 20 kN/m^3. **(16 Marks)**

Module-5

9 A stone masonry abutment used for highway bridge having bottom width of 2 m and top width of 1m. The height of the abutment is 3m. The vertical load is 15 kN, the live load and dead load being 20 kN acting at $1/3^{rd}$ of the height from the base. SBC of soil is 150 kN/m^2. Coefficient of friction in 0.5, the density of stone masonry in 25 kN/m^3. Compute the stress developed at the base and check the stability of the abutment. **(16 Marks)**

OR

10 a. List the types of Expansion bearing. Briefly explain any one with neat sketch. **(08 Marks)**

    b. List the types of expansion joints used in bridges and briefly explain any one with neat sketch. **(08 Marks)**

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