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10CV766

Seventh Semester B.E. Degree Examination, June/July 2015
Design and Drawing of Bridges

Time: 4 hrs. Max. Marks:100

Note: *1. Answer any TWO full questions from Part-A and ONE from Part-B.*
2. Use of IS456-2000, IRC21-1987, steel tables, Pigeard's curves are permitted.

PART – A

1 a. Define the term Bridge. Discuss the classification of bridges. **(08 Marks)**

b. Explain various methods employed to finding design discharge. **(08 Marks)**

c. Explain the terms with equation: i) Linear water; ii) Depth of scour. **(04 Marks)**

2 a. Design a pipe culvert through a road embankment of height 3m. The top width of the road is 7.5m and formation width is 10m. The slope of the embankment is 1.5:1. The maximum discharge is 1.57 m^3/s. The safe velocity is 2.00 m/s. IRC class AA wheeled vehicle of max. load of 62.50kN. Take C_S is 0.032 and unit weight of soil is 20kN/m^3, 3EBS = 111 kN/m. Use NP_3 1000/1200 pipes. Longitudinal steel 5.8 kg/m and spiral steel 44kg/m. Unit weight of soil is 20kN/m^3. Load due to earth fill is 59.5 kN/m. **(15 Marks)**

b. Draw the longitudinal section of the pipe showing embankment details. **(05 Marks)**

3 a. Across a stream a RCC slab culvert of single slab for two lane 6m clear length is proposed to a NH to suit the following details:

Clear span	= 6m, bearing width = 400mm
Stream B.L	= 50.00m
HFL	= 53.00m
Hard rock strata	= 48.00m
Width of footpath – 1m on eitherside and height 1m	
W.C. thickness	= 80mm
R. formation level	= 57.00m
Slop of embankment	= 1.5:1
Loading	= 1 RC class AA tracked vehicle
I.F.	= 0.213
Constant K	= 2.84

Materials : M_{20} grade and Fe-415 steel.
Design parameters : m = 13, n = 0.33, j = 0.89, Q = 1.008.
Design deck slab (shear need not be checked). **(15 Marks)**

b. Draw the details of the reinforcements in the longitudinal section of the deck slab. **(05 Marks)**

PART – B

4 a. A RCC T-beam slab type bridge is proposed across a stream for a NH to suit the following data:

Clear width of road	= 7.5m
Eff span	= 16m
Bed level of stream	= 100.00mm
HFL	= 105.00m
G.L	= 106.00m
R.F.L	= 108.00m
Hard rock strata	= 98.50m
Side slope of embankment	= 1.5:1
Bedwidth of stream	= 16m
Side slopes of stream	= 1:1
Kerbs	= 600mm × 300mm (depth) on eitherside
Thickness P.C.C. wearing coat	= 80mm

Three longitudinal girders at 2.5 m c/c.
Five cross girders at 4.0 m c/c.
Use M20 grade concrete mix and Fe-415 steel.
Design:

I. An intermediate panel of deck slab for 1RC class AA tracked vehicles (shear need not be checked), take the following:
   i) I.F = 25%
   ii) Moment coefficients for dead load B.M: $m_1 = 0.049$, $m_2 = 0.015$
   iii) Moment coefficients for LLBM : $m_1 = 0.085$, $m_2 = 0.024$.

II. An intermediate longitudinal girders using Courbon's method for the same load. Impact factor (I.F) = 10%. **(30 Marks)**

b. Draw the following views to a suitable scale
   i) Half longitudinal section and half longitudinal elevation. **(15 Marks)**
   ii) Half plan @ top and half plan at foundation level. **(15 Marks)**

5 a. Design a composite bridge deck consisting of RCC slab on steel girders to suit the following details:

Span of the bridge	= 15.0m
Loading	= 1RC class AA (tracked vehicles)
Road width	= 7.5m
Kerb	= 600mm × 300mm (depth) either side
No. of steel girders	= 4.0
Spacing of girders	= 2.5m c/c
Materials : M25 grade and Fe415 steel	
Impact factor	= 0.25
Bed level R.L.	= 250.0m
Bed width	= 21m
Stream bund top	= 252.50m
Road top level	= 255.50m
Hard rock strata	= 248.50m
Wind wall	= return type

Design:

i) An intermediate panel deck slab Pigeard's coefficients for dead load $M_1 = 0.045$ and $M_2 = 0.028$ for live load $M_1 = 0.08$ and $M_2 = 0.0425$.
ii) An intermediate girder with check for shear and deflection.
iii) Suitable shear connectors. Girder bearing stress 165 kN/mm^2 and shear stress 94.5 N/mm^2. **(30 Marks)**

b. Draw the following views to a suitable scale:
   i) Half longitudinal section and elevation. **(15 Marks)**
   ii) Half plan @ top and half at bottom. **(15 Marks)**

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