5. Attempt any **one** part : **(20×1=20)**

(a) Design wall type RCC pier for the following data :

Top width of pier	=	1 m with semi-circular ends
Length of pier	=	7 m excluding the semi-circular part
Height of above footing	=	10 m
HFL above the top of footing	=	8 m
Total DL Reaction	=	2000 kN
Total LL Reaction	=	1100 kN
Tractive force	=	130 kN
c/c distance of bearing on either side of centre line of pier	=	1 m
BM in traffic direction due to unequal DL and LL	=	600 kN-m
Material of pier and footing	=	M 40 and Fe 500
Safe bearing capacity	=	200 kN/m^2
Velocity of water current	=	4 m/s

Consider the cross current, also design the RCC footing and reinforcement in pier; check the stresses at the bottom of pier.

(b) What is the function of bearings in bridges ? Design an elastomeric bearing at the sliding end of a bridge for the following data : Maximum Normal load 1000 kN, Minimum–Normal Load 200 kN, Transverse Lateral Load 40 kN, Longitudinal Load 60 kN, Total Longitudinal Translation 15 mm, Rotation at support 0.0025 radians. Shear modulus of elastomeric bearing = 1.2 N/mm^2. Allowable compressive stress for concrete = 7 N/mm^2. Allowable compressive stress for elastomer = 10 N/mm^2.

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2684 **Roll No.** | | | | | | | | | | |

B.Tech.

(SEM. VII) ODD SEMESTER THEORY EXAMINATION 2013-14

BRIDGE ENGINEERING

Time : 3 Hours *Total Marks : 100*

Note :– Attempt **all** the questions. All questions carry equal marks. Assume any missing data, suitably.

1. Attempt any **four** parts : **(5×4=20)**

(a) Explain the factors to be considered while selecting suitable site for a bridge.

(b) What are the factors that affect the development of bridges ? Write the name of various types of bridges.

(c) Write a short note on Forces on Abutments. What are the factors affecting the span of bridge ?

(d) What are the functions of bearings in bridges ? Sketch an elastomeric bearing and mark its parts.

(e) What specifications should be followed while designing a bridge ?

(f) How will you design a bridge by a method given by M. Pigeaud ? Also write the specialty of this method.

2. Attempt any **one** part : **(20×1=20)**

(a) Design the culvert with the data :

Clear span of the culvert	=	7 m
Clear carriage way width	=	7.5 m

Size of kerb = 300 mm × 600 mm

Average thickness of wearing coat = 100 mm

Use M 25 concrete and Fe 500 steel

Loading = IRC Class A

Draw the cross section showing details of reinforcement at mid-span and at the junction of the slabs are kerbs.

(b) Design a slab culvert for the following data :

Effective span = 4.5 m

Clear width of carriageway = 7.5 m

Thickness of wearing coat = 70 mm

Provide footpath of 750 mm wide on either side

Loading = IRC Class A

Use M 20 concrete and Fe 415 steel. Design and detail the slab bridge.

3. Attempt any **one** part : **(20×1=20)**

(a) Design intermediate post tensioned prestressed concrete Tee Beam Bridge girder for the following data :

Effective span = 15 m

Width of carriageway = 7.5 m

No. of beams 4, equally spaced along the carriageway width

Spacing of cross girders = 3 m c/c

No footpath on either side loading class = IRC Class AA

Kerb size = 150 mm × 600 mm

Use concrete of grade M 45 and steel of grade Fe 500

Design should include detail load, bending moment calculation. Check fiber stresses in concrete. Draw sketches showing cable profiles.

(b) Design a box culvert having inside dimensions 4 m × 4 m for the following data :

Dead load = 12 kN/m^2

Live load = 46 kN/m^2

Density of soil = 18 kN/m^3

Use M 20 concrete and Fe 415 steel.

4. Attempt any **one** part : **(20×1=20)**

(a) Design a reinforced elastomeric bearing at a pinned end of a plate girder of a bridge with following data :

Maximum vertical load = 1000 kN

Dynamic vertical load = 80 kN

Transverse lateral load = 40 kN

Longitudinal load = 50 kN

Longitudinal total translation 12 mm

Rotation at support 0.003^o

Shear modulus of elastomeric bearing = 1.2 N/mm^2

Allowable compressive stress for concrete = 8 N/mm^2

Allowable compressive stress for elastomer = 10 N/mm^2

(b) An open web girder bridge consists of two Pratt trusses of the type shown in the Fig. 4.1. The span of the truss is 24 m c/c of bearings. The bridge supports an equivalent uniformly distributed live load of 185 kN per metre run. The dead load transmitted to each truss inclusive of self – weight is 16.5 kN/m. Design the members U_2L_3 and U_5L_4. Assume the impact factor to be 15%.

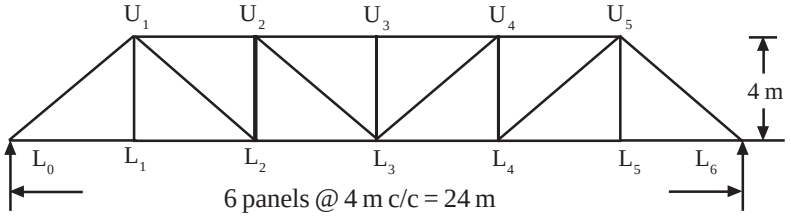

Fig. 4.1