(b) Verify the stability of the abutment shown in Fig. 5.1. The other salient details are given below :

Material of the abutment	:	Concrete
Density of the soil	:	18 kN/m^3
Coefficient of friction	:	0.6
Angle of repose of the soil, φ	:	30^o
Live load on the bridge	:	IRC Class AA (Tracked)

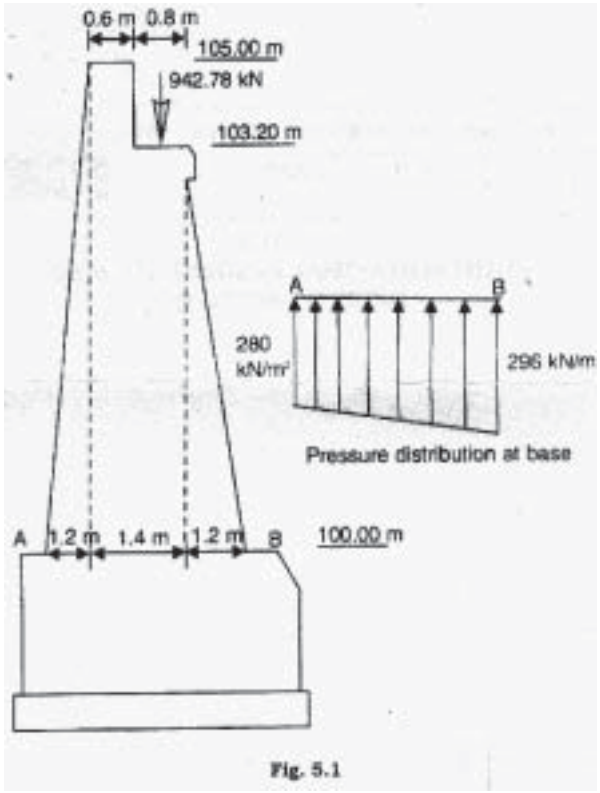

Fig. 5.1

Printed Pages—4 **ECE031**

(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 2012–13

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

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

(c) Discuss briefly the factors to be considered while deciding the suitability of the site for a permanent bridge over a hill stream.

(d) Why it is necessary to calculate afflux while designing the waterway of a bridge ?

(e) Explain the class A and class B loading as per IRC.

(f) How will you use the various design curves given by M. Pigeaud ? Also discuss the advantages of these curves in bridge design.

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

(a) Explain the Courbon's theory for proportioning the live loads on the cross girders in detail. Also discuss the calculations involved in this theory. On which conditions this theory is applicable ?

Describe the various methods for the analysis of slabs subjected to the concentrated load.

(b) Design a deck slab for the following particulars :

Clear span	:	5.5 m
Width of the footpath	:	1 m on either side
Wearing coat	:	100 mm
Loading	:	IRC Class AA (Tracked)
Materials	:	M 35 Concrete and Fe 415 Steel

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

(a) Draw a typical view of a box culvert. Also discuss why the box culverts are economical. Explain in detail the steps of designing of the following for a box culvert :

(i) Loads and reactions of box culvert

(ii) Structural design of box culvert

(iii) Hydraulic design of box culvert.

(b) Obtain Courbon's reaction factor and the maximum bending moment in case of a T-beam bridge having the following details :

Roadway	:	2 lanes
Loading	:	IRC Class A
No. of main Girders	:	3
c/c spacing	:	2.6 m
Span of the bridge	:	16 m
Kerb width	:	600 m on either side

4. Attempt any **two** parts : **(10×2=20)**

(a) Explain the various types of steel bridges with their neat sketches :

Deck Type Bridge, Through Type Bridge, Arch Bridges, Suspension Bridges and Truss Bridges.

(b) An open web girder bridge consists to 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 175 kN per metre run. The dead load transmitted to each truss inclusive of self weight is 15 kN/m. Design the members U_4L_3. Assume the impact factor to be 15%.

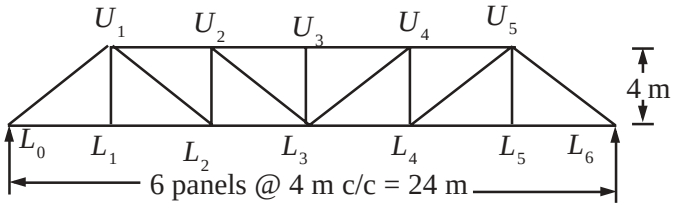

Fig.4.1

(c) Discuss about the various forces acting on the steel bridges. Also define the "Economical Span".

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

(a) Design an elastomeric unreinforced neoprene pad bearing to suit the following data :

Vertical load (sustained)	:	200 kN
Vertical load (dynamic)	:	40 kN
Horizontal force	:	60 kN
Modulus of rigidity of elastomer	:	1 N/mm^2
Friction coefficient	:	0.3