

23232

M.Tech. (Civil Engg.) Transportation Engg.

(Elective-I) 1st Semester

Examination, November-2023

BRIDGE ENGINEERING

Paper-CE-617

Time allowed : 3 hours] [Maximum marks : 100

Note : Attempt any five questions. All questions carry equal marks.

1. (a) Discuss about the stability analysis of abutments.
(b) Explain the importance of Hydraulic design in Bridge Engineering.

2. Verify the stability of abutment. The salient details are given below Fig.1.

Material of the abutment : Concrete.

Live load : IRC AA (Tracked).

Density = 18 kN/m^3

Angle of repose = 30°

Coefficient of friction = 0.6

Span of bridge = 15 m.

Angle of friction between soil and concrete = 18° .

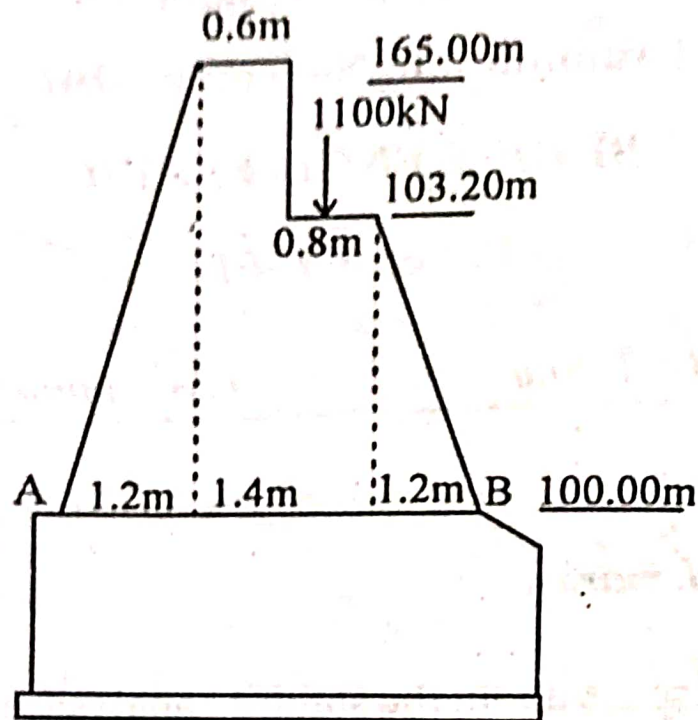


Fig. 1.

3. Design a solid slab bridge required for a highway road having the following data.

Width of carriage way = 7.5 m.

Clear Span = 5m

Loading = IRC Class A.

Width of Kerb = 600 mm

Materials = M 30 concrete and Fe 415 grade steel.

4. Determine the minimum section modulus, prestressing force and eccentricity of a prestressed concrete slab bridge having the following data :

Clear span - 10m, Width of bearing-400 mm,
Carriageway width-2 lane, Footpath on either side-1 m.

Live load-IRC Class AA tracked vehicle.

Materials-M40 concrete, Ultimate tensile strength of steel-1500 N/mm²

Compressive stress of concrete at transfer.

$f_{ci} = 35 \text{ N/mm}^2$, $f_{ct} = 15 \text{ N/mm}^2$, $f_{cw} = 12 \text{ N/mm}^2$,
 $f_{it} = f_{tw} = 0$, Loss ratio = 0.8.

5. (a) Describe the various design requirements of shear connectors.
- (b) List the various loads that are to be considered for a pier design.
- (c) Sketch and show various parts of a composite girder bridge indicating how it is supported on the pier.

6. Discuss in detail the major cause of bridge failures. Indicate how these failures could be avoided.

7. Design a box culvert for the following data :

Inside dimensions of box culvert = $3\text{m} \times 3\text{m}$

Superimposed dead load on box culvert = 12 kN/m^2 .

Live load on box culvert = 40 kN/m^2 .

Unit weight of soil = 18 kN/m^3 , ϕ of soil = 30° , Use M20 concrete and Fe 415 steel.

Consider only one load combination. DL + LL while no water inside the drain.

8. Design the intermediate beam of a prestressed concrete bridge of clear span 25m. Assume the roadway width as 7.5m., loading IRC class 70R tracked vehicle.