

23750

**M. Tech 3rd Semester Civil Engg
(Computer Aided Structural Engineering)**

Examination, November-2023

BRIDGE ENGINEERING

Paper- 21MTCASE 23C2

Time allowed : 3 hours] [Maximum marks : 100

Note: Question No. 1 is compulsory. Attempt five questions in total.

1. Write short note on: 4×5=20

(a) Economic evaluation of a bridge

(b) Girder bridges

(c) Long span bridges

(d) Prestressed concrete bridges.

2. A reinforced concrete simply supported slab is required for the deck of a road bridge having the following data:- 20

(i) Clear span = 15 m.

(ii) Width of carriage way = 7.5 m.

- (iii) Foot path on either side = 1.2 m wide.
 - (iv) Materials = M25 grade concrete and Fe 415 steel.
 - (v) Type of loading IRC class AA. design the deck slab. show the reinforcement details.
3. Design the longitudinal girder of a T-beam and slab bridge for the following data:
- Effective span 12m, Carriage way width 7.5m, Kerb 500 mm on either side. Provide three longitudinal beams and five cross beams. Loading IRC class AA tracked vehicle. Adopt M20 for Concrete Fe415 bars. Also provide the reinforcement details. Use Courbon's method for the calculation of reaction coefficients.
4. Design the intermediate beam of a prestressed concrete bridge of clear span 18m. Assume the roadway width as 7.5 m., loading IRC class 70R tracked vehicle. 20
5. Design an elastomeric bearing at the sliding end of a bridge for the following data. Maximum-Normal load 1200 kN, Minimum-Normal load 300 kN, Transverse lateral load 50 kN, Longitudinal load 70 kN, Total longitudinal translation 20 mm, Rotation at support 0.0020 radians. Shear modulus of elastomeric bearing = 2.0 N/mm². Allowable compressive stress for concrete = 10 N/mm². Allowable compressive stress for elastomer = 8 N/mm².

6. Design a reinforced concrete abutment using following data:

Dimensions : shown in Fig.

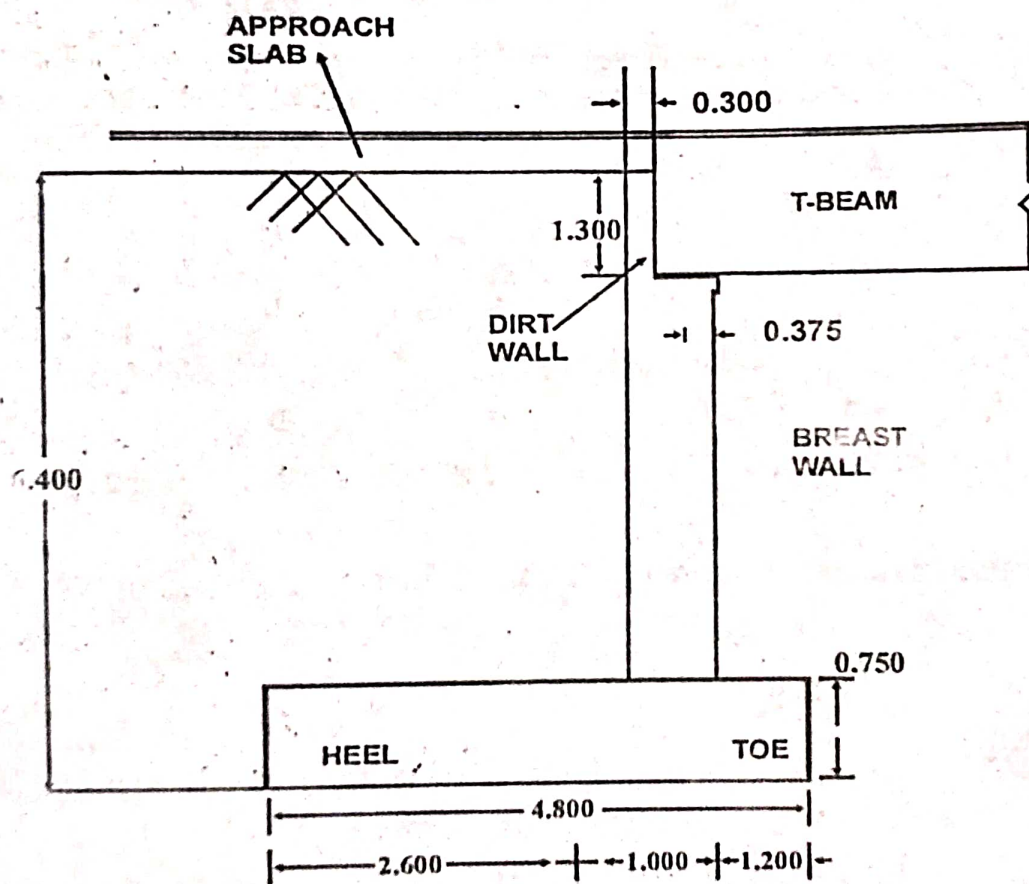
Superstructure : T-beam two-lane bridge of effective span 20 m.

Overall length : 20m

Loading : As for National Highway

Back fill: Gravel with angle of repose = 30°

Unit weight of back fill $w = 20 \text{ kN/m}^3$



ALL DIMENSION IN m

7. (a) Design a box culvert having inside dimensions $5\text{m} \times 3\text{m}$ for the following data: $10+10=20$

Dead load = 16 kN/m^2

Live load = 52 kN/m^2

Density of soil = 18 kN/m^3

Use M25 concrete and Fe 415 steel.

- (b) Explain the various components of a bridge.

8. Discuss in detail the major cause of bridge failures. Discuss what are the precautionary measures to protect the bridge from these failures. 20