



M.E DEGREE EXAMINATIONS: NOV/DEC 2023

(Regulation 2018)

First Semester

STRUCTURAL ENGINEERING

P18SEE0001: Design of Bridges

COURSE OUTCOMES

CO1: Calculate loads for different types of Bridges.

CO2: Design short span and long span bridges.

CO3: Design bearings and substructure for bridges.

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. The width of carriage way for a single lane bridge should not be less than CO1 [K₂]
 - a) 3.25m
 - b) 3.5m
 - c) 4.25m
 - d) 4.5m
2. The total load of a class A (wheeled vehicle) as per IRC loading is CO1 [K₂]
 - a) 55.4t
 - b) 50.4t
 - c) 45.4t
 - d) 40.4t
3. As per Pigeaud's curve, the moment coefficient m_1 along the shorter direction is found as 0.15. whereas the moment coefficient m_2 along the longer direction is found as 0.07. considering poisson's ratio of concrete as 0.2 and the total load P as 25 kN, the bending moment along the shorter direction is equal to: CO2 [K₃]
 - a) 3.075 kNm
 - b) 4.100 kNm
 - c) 5.125 kNm
 - d) 6.150 kNm
4. Matching type item with multiple choice code CO1 [K₂]

List I	List II
A. Cofferdam	i. Temporary structure built for the purpose of excluding water/soil in the working area
B. Dirt Wall	ii. Built to prevent the spill of materials

C. Causeway	iii. To allow flood/water to pass through/over it
D. Chamber	iv. Transverse inclination to ensure proper drainage

A B C D

- a) i iv iii ii
b) ii i iv iii
c) i ii iii iv
d) ii iii i iv

5. Assertion (A): Abutment is a structure located at the end of a bridge. CO3 [K₂]

Reason (R): Abutments are connecting the approach road to the bridge deck

- a) Both A and R are true, and R is the correct explanation of A b) Both A and R are true, and R is not a correct explanation of A
c) A is true but R is false d) A is false but R is true

6. Width and height of kerbs on bridges are generally _____ respectively. CO1 [K₂]

- a) 600 x 225 mm b) 450 x 200 mm
c) 225 x 600 mm d) 200 x 450 mm

7. Which of the following shall be considered while designing high-level bridges for buoyancy effect? CO3 [K₂]

- a) Buoyancy forces due to the submerged part of the substructure and foundation b) Full buoyancy for the abutments
c) Partial buoyancy for the superstructure d) Full buoyancy for the superstructure

8. Courbon's method of design of the bridge is applicable when the ratio of span width is between _____ and _____. CO2 [K₂]

- a) 3, 4 b) 1, 4
c) 5, 4 d) 2, 4

9. The height of the bridge is kept _____ above the high flood level. CO2 [K₂]

- a) 1.2 to 1.5 m b) 1.8 to 2.1 m
c) 2.2 to 2.5 m d) >2.5 m

10. Consider the following statements: CO3 [K₂]

- i. A braced cofferdam is used in shallow trench excavation as well as in deep excavation exceeding 6 m in depth.
ii. Cofferdams braced or un-braced, are temporary structures either on land or in

Breaking forces: 140 kN

Wind pressure on pier: 2.4 kN/m²

Height of Pier: 10 m

Top width: 2.2 m

Bottom width: 3.0 m

Depth of water above base level: 8.5 m

Length of pier: 10 m

Determine the stresses at the base for the following cases:

1. DL and Self weight of the Pier
2. Effect of Buoyancy
3. Due to eccentricity of LL

26. Enlist the functions of the bridge bearings. CO3 [K₂]

Answer any TWO Questions

PART D (4 x 10 = 40 Marks)

27. Design the deck slab for the following details: CO2 [K₃]

Clear Span: 5.5.m

Width of Footpath: 1m on either side

Wearing coat: 100mm

Loading: IRC class AA (Tracked)

Materials: M35 concrete and Fe 415 steel

Assume suitable data if required.

28. Enumerate the steps involved in the design of box girder bridge. CO2 [K₂]

29. Compare IRC class 70R, class A and class B loading. CO1 [K₂]

30. Elaborate the step-by-step procedure for the design of a post-tensioned prestressed concrete deck slab. CO2 [K₂]

31. Design an elastomeric unreinforced neoprene pad bearing to suit the following data: CO3 [K₃]

Vertical load (sustained): 200 kN

Vertical load (dynamic): 40 kN

Horizontal force: 60 kN

Modulus of rigidity of elastomer: 1 N/mm²

Friction coefficient: 0.3
