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The Assam Royal Global University, Guwahati
Royal School of Engineering & Technology
B.Tech.(Civil Engineering) 7th Semester
Special Supplementary Examination, August 2024
Course Title: Bridge Engineering
Course Code: CEE022D703

Time: 3 Hours

Maximum Marks: 70

Note: Attempt all questions as per instructions given.
The figures in the right-hand margin indicate marks.
(Table for K value & Pigeaud's Curve Allowed)

Section – A

- Q.1. Attempt **all** questions. (Maximum word limit 50) 2x8
- Explain classification of bridges done on various basis.
 - Differentiate between pier and abutment in a bridge.
 - Justify the functionality of wing wall in a R.C.C Tee beam bridge.
 - List out the different categories of IRC loading standards used in designing highway bridge decks.
 - What are bridge bearings? Mention the forces coming on bridge bearings.
 - Write a short note on fixed & expansion bearings.
 - Discuss in brief the advantages of Prestressed concrete over RCC.
 - What are tendons in prestressed concrete?

Section – B

- Q.2. Attempt **any two** of the following 6 x 2
- What are the ideal conditions for site selection of a bridge? Explain.
 - Draw a neat sketch explaining IRC Class AA and Class A loading.
 - What is scouring? Explain the difference between normal and maximum scour depth.
- Q.3. Attempt **any two** of the following 7 x 2
- For a slab culvert the following information are available
 - Clear span = 6m
 - No. of lane = 2
 - Live load = IRC 70R Tracked vehicle.

Find the magnitude of design moment for the slab culvert. Assume any missing data.

(1)

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b. For the slab culvert of clear span 6m and live load of IRC AA tracked vehicle as mentioned in Q.3(a), find the magnitude of design shear force.

c. The interior panel of a deck slab in a T-Beam bridge is 3.3m x 2.7m. Find the maximum short span and long span bending moments when IRC Class A loading is crossing over the bridge. Consider two-wheel loads each of 57kN adjusted symmetrically with respect to centre of panel. Assume any missing data.

Q.4. Attempt **any two** of the following

7x2

a. A longitudinal girder assembly is to be designed for the given information.

- I. Span of bridge=16m
- II. Roadway- 2 lane
- III. Three longitudinal girders at c/c spacing of 2.5m
- IV. Kerb width=0.61m

Compute the maximum dead load bending moment. Any missing data can be assumed.

b. For design of the longitudinal girder assembly of the bridge of span 16m as mentioned in Q.4(a), compute the maximum live load bending moment and live load shear force when live load IRC Class AA Tracked vehicle crosses over the bridge

c. A longitudinal girder assembly needs to be designed for a 2-lane bridge with 18m span. Compute the maximum live load bending moment and live load shear force when live load IRC Class B vehicle crosses over the bridge. Assume any missing data.

Q.5. Attempt **any one** of the following

14x1

- a. Explain in detail the stress and load balancing concept of prestressed concrete. Derive the expression of resultant stress at end and mid-section of a prestressed concrete beam when (a) Prestressing force is applied concentrically & (b) Prestressing force is applied eccentrically.
- b. Design a rocker and roller bearing for a 25m spanned T-beam bridge where a reaction of 2000kN is expected at the supports. The necessary information for design are as follows:

Allowable pressure on rollers=5N/mm diameter/mm length

Bearing pressure on rocker pin=30N/mm²

Allowable pressure on bearing plate=2000N/mm²

Allowable pressure on concrete bed block=3.8N/mm²

Draw a neat sketch showing the design details of the rocker and roller bearing designed.