B.E. CIVIL ENGINEERING THIRD YEAR SECOND SEMESTER SUPPLEMENTARY EXAMINATION 2023

BRIDGE ENGINEERING (ELECTIVE II)

Time 3 hours Full marks 100

Use separate answer scripts for each part

Part- I **(40 Marks)**

Answer ALL questions. Full marks 40. **Permitted codes**: IRC 5, IRC 6 and IRC SP13

1. Determine the **design discharge** at a bridge site after computing the maximum discharge by
   a) Empirical Methods
   b) Rational Method, and
   c) Area-Velocity Method, for the following data:

Catchment area = 160 sq. km
Distance of site from coast = 12 km
Distance of critical point to bridge site =16 km
Difference in elevation between the critical point and the bridge site = 96 m
Peak intensity of rainfall = 60 mm/h
Surface of catchment is loam, largely cultivated.
Cross sectional area of stream at HFL at bridge site = 120 sq. m
Wetted perimeter of stream at HFL at bridge site = 90 m
Stream condition - Clean straight banks, Fair condition.
Slope of stream = 1/500.

Hence find linear waterway assuming a regime flow on alluvial bed, and RL for the maximum scour level for a possible abutment. Marks: 4+8+5+3 = 20 (CO -2)

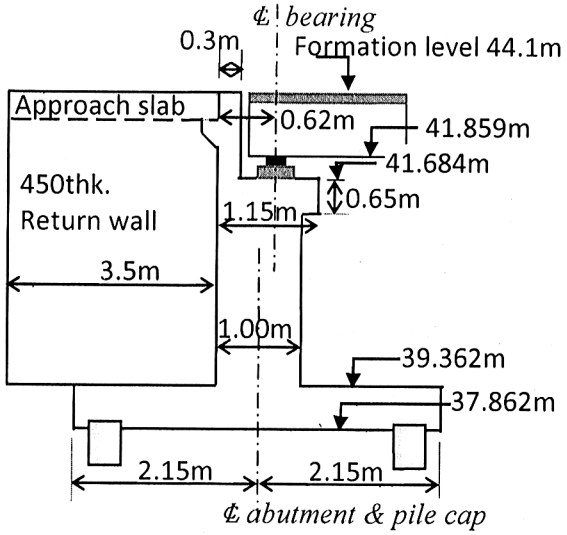

Fig. Q2

2. Consider the abutment shown in Fig. Q2, that supports a superstructure of 21 m clear span (21.6m out to out). Compute
   (a) the **maximum longitudinal and transverse moments** at the bases of abutment and pile cap due to **two-lane class A vehicle** loading.
   (b) the longitudinal moments at the bases of abutment and pile cap due to creep and shrinkage.
   (c) The longitudinal moments at the bases of abutment and pile cap due to **braking** if we adopt **elastomeric bearing**. Marks: 7+9+8 = 20 (CO -4)

Ex/CE/PE/B/T/422A/2023(S)

B.E. CIVIL ENGINEERING THIRD YEAR SECOND SEMESTER SUPPLEMENTARY EXAMINATION 2023

BRIDGE ENGINEERING (ELECTIVE II)

Time 3 hours Full marks 100

PART-II (MARKS-60)

Use a separate Answer-Script for each part

IRC-6, IRC -112, IS 456, SP 16 and required charts and tables are allowed in the exam hall

Assume any other required data if not stated

No. of questions	Answer question 1 and 2	Marks 20+40=60
1.	a) Discuss different type of loading coming on bridges. b) Describe the classification of different types of bridges.	CO1 10+10=20
2.	A R.C.C. Tee beam girder bridge shown in figure 1. has the following data: Clear width of carriage way=7.5 m Span (center to center of bearings) =15 m. Kerbs on either side = 600 by 300 mm Live load : IRC Class AA tracked vehicle Thickness of the wearing coat =80 mm Materials: M-30 Grade concrete and Fe-415 HYSD reinforcements. Three main girders are provided at 2.5 m center to center. The thickness of deck slab 250 mm. Width of main girder 300 mm. Assume depth of main girder and depth and width of cross girder. Cross girders are provided at 3.75 m interval.	CO3

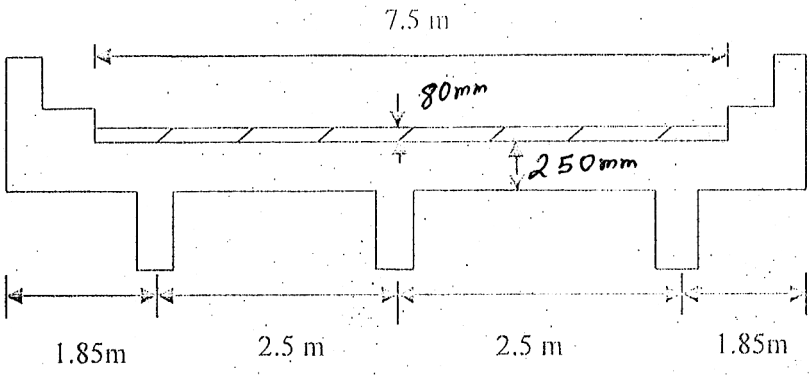

Figure 1.

Design the longitudinal girder and cross girder of the bridge using IRC 6, IRC 112 and IS 456 with the above data. Draw the necessary reinforcement detail with neat sketches. 30+10=40