

Note: (a) All questions are compulsory.

(b) Marks are indicated against each question in square brackets.

(c) Assume missing data suitably, if any. Use of Pigeaud's curves is allowed.

Q.1. Answer/describe the following. [7x1=7]

- (a) Write the major components of a concrete bridge.
- (b) Why is design discharge important for bridge design?
- (c) Write the expression for impact factor for IRC Class A loading.
- (d) Why are cross-beams provided in T-beam Bridge?
- (e) What is the main advantage of using framed piers over non-framed piers?
- (f) What is the function of bearings in bridges?
- (g) What is expansion bearing? Give its various types.

Q.2. A T-beam bridge (Figure-1) has to be provided across a channel with the following data.

<ul style="list-style-type: none"> • Flood discharge: 30 m³/s • Bed width: 12 m • Side slope: 1:1 • Bed level: 50 m • HFL: 51.25 m • Maximum allowable afflux: 1.5 cm 	<ul style="list-style-type: none"> • Road: National highway (2-lane) • Footpath: 1 m wide on either side • Loading: IRC Class AA • Materials: M40 concrete Fe415 steel • No. of longitudinal girders: 3
--	--

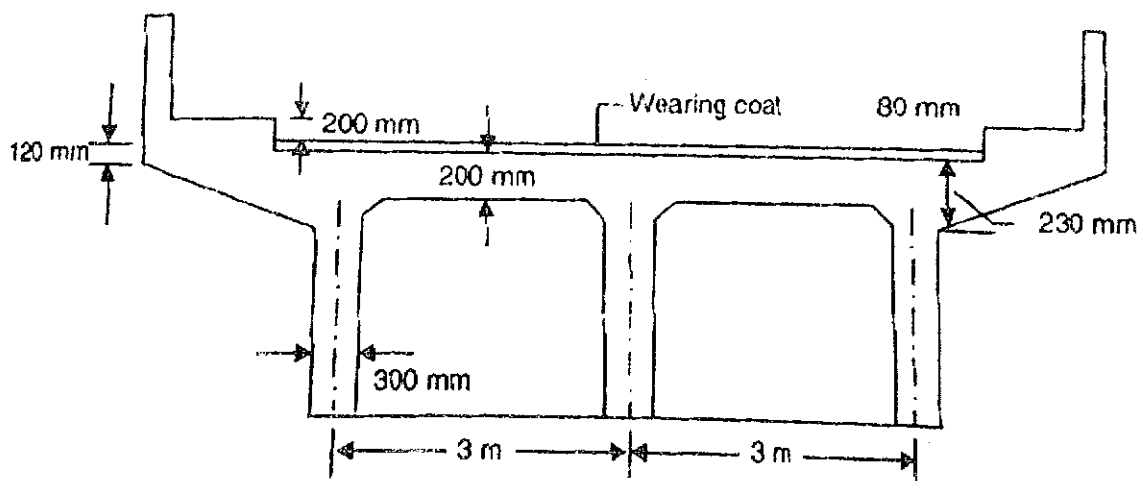


Figure 1

- (a) Design the linear waterway, and (c) For the cantilever slab portion (Figure-2), of the bridge given in Ques. II above, calculate the design moment and design shear only. [3+4=7]
- (b). For the longitudinal girder of T-beam bridge in Figure-1, calculate the design moment for IRC Class AA (track) loading. [10]

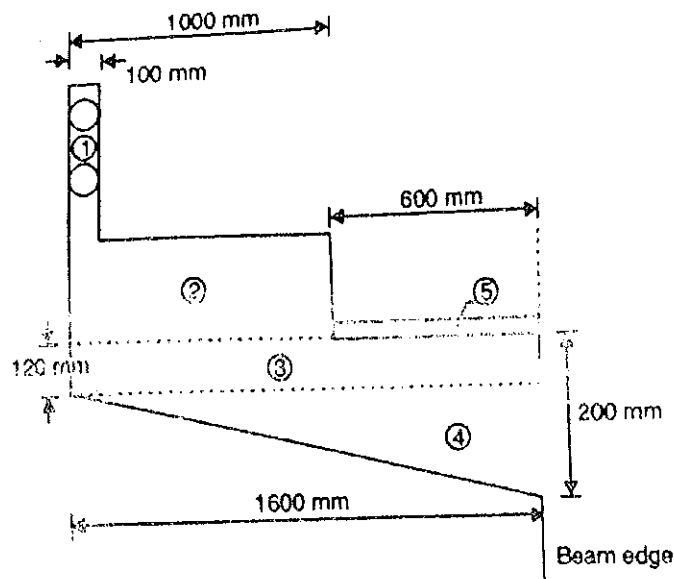


Figure-2

- Q.3. It is required to design an elastomeric pad bearing for a two-lane RC T-beam bridge of 15 m clear span with the following data: [6]
- Maximum dead load reaction per bearing = 280 kN.
 - Maximum live load reaction per bearing = 520 kN.
 - Vertical reaction induced by longitudinal forces per bearing = 12 kN
 - Longitudinal force per bearing = 33 kN
 - Concrete grade for T-beam and bed-block over pier = M20.
 - Rotation at bearing of superstructure due to D.L. and L.L. = 0.0025 radian.
 - Use 250 × 500 mm pads with 39 mm thickness. Take $A_1/A_2 > 2$.

- Q.4. Show different types of bridge piers with simple diagrams along with relative merits? Also write different loads considered for design of piers. [5]

-----End of Paper-----

Important Formulas:

Handwritten note: The formulas given by the question are for data.

