B. Tech.

(SEM. VIII) EXAMINATION, 2006-07

STEEL STRUCTURES – II

Time : 3 Hours] [Total Marks : 100

Notes : (1) Attempt all questions.
(2) Use of IS 800 and steel tables are allowed.
(3) In case of numerical problems assume suitable data wherever not provided.

1. Attempt any two parts of the following : 10×2 = 20

   (a) Sketch various types of roof trusses used in industrial buildings. What do you mean by economical spacing of a truss?

   (b) Enlist various types of loads which are considered in design of an industrial structure. Explain how will you calculate wind load on an industrial shed?

   (c) Design an angle iron purlin for a trussed roof from the following data:

      Span of roof truss = 12 m
      Spacing of roof trusses = 5 m
      Spacing of purlins along the slope of roof truss = 2 m
      Slope of the roof truss = 1 vertical to 2 horizontal
      Wind load normal to roof = 1 kN/m²
      Vertical load from roof sheeting = 0.2 kN/m²
2. Attempt any two parts of the following \(10 \times 2 = 20\)
(a) Give stepwise design procedure for designing a gantry girder as per IS Code.
(b) Sketch different types of columns (crane columns) which support the gantry girders: Why the bracing in an industrial building bent are done? Discuss different types of bracing.
(c) Draw a neat sketch of a 2 tier grillage foundation and explain design analysis.

3. Attempt any one part of the following \(20 \times 1 = 20\)
(a) Design the maximum section of a riveted plato girder to carry a superimposed load of 100 kN/m on an effective span of 24 m.
(b) A welded plate girder has to be designed to carry a superimposed load of 100 kN per metre. The span of the girder is 22 m. Design the flange plates of the plate girder check the stress in the flange plates.

4. Attempt any one part of the following \(20 \times 1 = 20\)
(a) Design web splice at 8 m from one support for the plate girder of Q. 3 (a)
(b) A simply supported riveted plate girder spans 13 m and carries a uniformly distributed load of 80 kN/m inclusive of self weight of girder. The plate girder consists of 1600 mm deep \(\times\) 12 mm thick web, plate, 2 ISA 200 mm \(\times\) 100 mm \(\times\) 15 mm flange angles and 500 \(\times\) 12 mm cover plate in each flange. Design end bearing stiffeners.

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Attempt any one part of the following: \( 20 \times 1 = 20 \)

A railway bridge is constructed to the following requirements:

(i) Type of bridge = deck type plate girder bridge
(ii) Span = 16m between centers of bearings
(iii) Gauge = Broad gauge, single track, main line
(iv) Distance between centres of plate girders = 2m
(v) Dead load of each girder may be determined by Fuller’s formula, \( W = 1200 \ L + 1000/\text{N/m} \)

where \( L = \text{Span in meters.} \)

(vi) Dead load of track with timber ties may be taken as 700 \text{N/m.}

(vii) Live load on the bridge may be taken as follows:

For B.M. = 1688 \text{kN} and for S.F. = 1881 \text{kN}

(viii) Impact factor = \( \frac{20}{14 + L} \)

The section of each of plate girder is as per following:
Web plate \( 1600 \times 10 \text{ mm} \)
Two ISA \( 150 \times 150 \times 12 \text{ mm} \) rivetted to cover plates of size \( 400 \text{ mm} \times 12 \text{ mm} \) two numbers in each flange. Do any one of the following:

(a) Find out stresses in the top and bottom flanges and check if the sections is adequate.

(b) Design the bearing stiffener for the above plate girder bridge.