

Q 8331

M.E. DEGREE EXAMINATION, MAY/JUNE 2006.

*Elective*

Structural Engineering

ST 1626 — DESIGN OF STEEL CONCRETE COMPOSITE STRUCTURES

(Regulation 2005)

Time : Three hours

Maximum : 100 marks

Use of relevant codes permitted.

Any additional data considered necessary may be suitably assumed.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

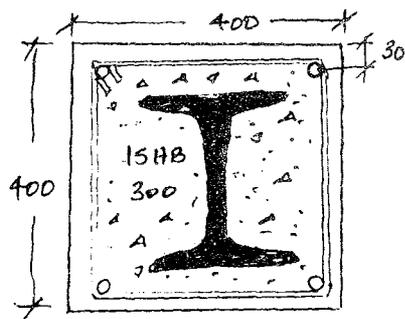
1. State the differences in Composite Construction as compared to Elastic and Plastic Theories.
2. Sketch the Load versus slip behaviour for brittle and ductile connectors.
3. Write down the moment capacity expression, which takes into account the influence to shear and moment in composite Beams.
4. Sketch the Rigid and Flexible types of Shear Connections.
5. What is long term loading and non-dimensional slenderness for composite columns?
6. Draw the interaction curve for a concrete filled rectangular tubular section subjected to compression and uniaxial bending.
7. State the steps in the preliminary design of composite truss.
8. Sketch any two types of Composite Truss and mark the salient details.
9. What is the effect of deck shape on shear connector?
10. State the advantages of Concrete Composite Construction in Buildings.

PART B — (5 × 16 = 80 marks)

11. (i) Describe the design philosophy of steel concrete sandwich construction. Illustrate with an example. (13)
- (ii) Draw the stress-strain diagram for a composite section. (3)
12. (a) Design a simply supported composite beam of span 10 m. The spacing of the beams are 3 m. The thickness of the slab is 150 mm. The floor is to carry an imposed load of 3 kN/m<sup>2</sup>, a partition load of 1 kN/m<sup>2</sup> and a floor finish load of 0.5 kN/m<sup>2</sup>. Use M 25 concrete and mild steel bars. Check the deflection of the beam in the serviceability criteria.

Or

- (b) Check the adequacy of the concrete encased composite section shown in Figure.



Concrete grade : M30  
 Design Axial load : 1500 KN  
 Design bending Moment : 200 KNm  
 about x-x axis  
 Reinforcing steel ( $f_y$ ) = 415 N/mm<sup>2</sup>  
 Structural steel (ISHB 300)  
 ( $f_y$ ) = 250 N/mm<sup>2</sup>.

13. (a) Derive necessary expressions for the ultimate moment of resistance for a composite beam with full shear connection.

Or

- (b) Illustrate with sketches the various types of shear connectors, State their relative merits and demerits.

14. (a) Describe the steps in the design of a composite box girder bridge.

Or

- (b) Sketch the different types of composite box girder bridges and indicate their advantages and disadvantages.

Illustrate four case studies in steel concrete composite construction in buildings.

Or

Explain with sketches the seismic behaviour of composite structures.

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