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**23393**

**M. Tech. 1st Sem. Civil Engg.  
(Specialisation in Structural Design)**

**Examination – December, 2013**

**DESIGN OF STRUCTURES – I**

**Paper : MTSD-104**

***Time : Three hours ] [ Maximum Marks : 100***

*Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.*

- Note :**
- (i) Attempt any *five* full questions. Out of total *eight* questions, in the question paper. All question carry equal marks.
  - (ii) Missing data. If any, may suitably be assumed and stated, properly.
  - (iii) Supplement your answers with suitable, proportionately drawn neat sketches, wherever required.
  - (iv) Consider the use of M-20 concrete and Fe-415HYSD steel bars, wherever not mentioned otherwise.

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- (v) Use of IS:456, IS: 800 and steel tables is permitted, as supplied by the examination superintendent.
1. (a) Discuss the role of a structural design engineer. 4  
(b) Discuss the steps of design; a design engineer will take, starting from the shape and the dimensions of the structure, as provided by the architect. 8  
(c) Draw stress strain curve of mild steel showing all salient points on it. Also discuss elastic-range, plastic-range and ductility, on this curve. 8
  2. A beam simply supported over an effective span of 10m, carries a uniformly distributed load of 60kN/m, inclusive of its own weight. The depth of the beam is restricted to 500 mm. Design the beam, assuming that the compression flange of the beam is laterally supported by the floor construction. Take  $f_y = 250 \text{ N/mm}^2$  and  $E = 2 \times 10^5 \text{ N/mm}^2$ . Assume width of the support = 200 mm. Also apply all the checks. Design of the joints, if any, is not required. 20
  3. What are gantry Girders ? Describe its components, with neat sketches. discuss their design procedure. 20
  4. (a) Describe the steps in the design of tension members. 4  
(b) Discuss different types of Roofing systems, for industrial structures with steel trusses. 16
  5. Discuss various design approaches of reinforced concrete design. Also compare between merits and demerits of each of these. 20
  6. Design a reinforced concrete slab, for a room measuring 5m  $\times$  6m, from inside. The slab carries a

live load of  $5 \text{ kN/m}^2$  and is finished with 25 mm thick floor finish with unit weight of  $10 \text{ kN/m}^3$ . The slab is simply supported, on 230 mm thick brick walls, on all four edges with corners held down. Use M-20 concrete and Fe-415 steel. The checks for shear and development length are not required. Show all reinforcement details in plans and sections. 20

7. A reinforced concrete square column  $600 \text{ mm} \times 600 \text{ mm}$  is reinforced with 8 bars of 25 mm diameter, symmetrically placed at a cover of 50 mm to the centre of the steel bars. Determine the minimum and maximum stresses in concrete, if the column is subjected to a load of 800 kN at an eccentricity of 60 mm about one of the axes. Also check whether the section is safe or not? The column consists of M-25 concrete and Fe-500 steel. 20
8. Using limit state method, Design an isolated footing of uniform thickness of a reinforced concrete square column of size  $500 \text{ mm} \times 500 \text{ mm}$  and transferring a vertical load of 700 kN. The safe bearing capacity of the soil may be taken as  $140 \text{ kN/m}^2$ . Use M-20 concrete and Fe-500 steel. 20