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Total No. of Pages : 03

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# B.Tech.(CE) (2011 Onwards) (Sem.-5) DESIGN OF STEEL STRUCTURES-I Subject Code : BTCE-501 M.Code : 70512

Time: 3 Hrs.

Max. Marks : 60

## **INSTRUCTION TO CANDIDATES :**

- 1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
- 2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
- 3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

## **SECTION-A**

#### Q.1 Answer briefly :

- (a) Why is steel considered superior for structural applications compared to the cast iron and wrought iron?
- (b) State the advantages of using wide flange beams over narrow ISMB beams.
- (c) What are the advantages of bolted connections over riveted or welded connections?
- (d) What is a pin connection? List some of the pinned connection used in steel structures?
- (e) State the possible failure modes of an axially loaded column. Why is it better to choose plastic or compact sections for columns?
- (f) What is difference between lacing and battens?
- (g) What is difference between laterally restrained and un-restrained sections?
- (h) What are the types of base plates used in practice?
- (i) What are various types of groove welds? What is difference between groove weld and fillet weld?
- (j) What are the different types of bracings used in a braced building?

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### **SECTION-B**

- Q.2 The plates of a tank 8 mm thick are connected by a single bolted lap joint with 20 mm diameter bolts at 50 mm pitch. Calculate the efficiency of the joint. Assume Fe 410 plate and grade 4.6 bolts.
- Q3. A single unequal angle  $100 \times 75 \times 6$  mm is connected to a 10 mm thick gusset plate at the ends with six 16 mm diameter bolts to transfer tension. Determine the design tensile strength of the angle assuming that the yield and the ultimate stress of steel used are 250 MPa and 410 MPa if gusset plate is connected to the 75 mm leg. Take g = 40mm.



#### Fig.

- Q4. The strut of a space frame member having a length of 3.5 m has to carry a factored load of 300 kN. Assuming yield stress of steel 250 Mpa. design a circular tube to carry the load. Assume that ends are simply supported.
- Q5. Design a base plate for an ISHB 200 column to carry a factored load of 600 kN. Assuming Fe 410 grade of steel and M25 concrete. Use the effective area method of design.
- Q6. A tie member used as a diagonal in a roof truss consists of two angles  $75 \times 50 \times 8$  mm (f<sub>y</sub> = 280 MPa) placed back to back on the each side of gusset plate. The rivets of 18 mm diameter are provided in one row and the angles are tack riveted. Determine the tensile strength of the member.

#### **SECTION-C**

- Q7. What are the advantages and drawbacks of the following :
  - (a) Aluminium decking
  - (b) GI sheeting
  - (c) Asbestos sheeting
  - (d) Ferrocement sheeting

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- Q8. A flat roof building of 18 m span has 1.5 m deep trusses at 5 m centres. The total dead load is 0.7 kN/m<sup>2</sup> and the imposed load is 0.75 kN/m<sup>2</sup>. Design the truss using angle sections with welded internal joints and bolted field splices.
- Q9. Design a beam of effective span 5 m and subjected to a bending moment of 187.5 kNm carrying a reinforced concrete floor capable of providing lateral restraint to the top compression flange. The uniformly distributed load is made up of 20 kN/m imposed load and 20 kN/m dead load and section is stiff against bearing. Assume Fe 410 grade steel.

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NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.