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Code No.: 32013 AS

VASAVI COLLEGE OF ENGINEERING (Autonomous), HYDERABAD
B.E. (Civil Engg.) III Year II-Semester Advanced Supplementary Examinations, June/July-2017

Design of Steel Structures-I

Time: 3 hours

Max. Marks: 70

- Note: i) Answer ALL questions in Part-A and any FIVE from Part-B
ii) Answer all questions of Part-A at one place and in the same order as they appear in the question paper.
iii) Use of IS: 800-2007 and steel tables are permitted.

Part-A (10 × 2 = 20 Marks)

1. List the hot rolled steel sections used in practice.
2. What are the different modes of failure in bolted joints? Explain any two of them.
3. How the shear lag affects the strength of tension members.
4. Give four practical examples where tension rods are used.
5. Why battens and laces are provided to built up columns?
6. Effective slenderness ratio of laced and battened columns are _____ and _____.
7. Classify the section ISMB 400 @ 61.6 kg/m to be used as a beam as per IS 800-2007 Take $f_y = 250$ MPa.
8. Draw any four sections used as beam members.
9. Calculate the shape factor of a rectangular section of width 'b' and depth 'd' when the neutral axis is parallel to the width.
10. Draw any three commonly used trusses and name the same.

Part-B (5 × 10 = 50 Marks)

11. a) Two steel plates of size 200 x 16mm are to be connected together by double cover Butt joint with M20 bolts of grade 4.6, to resist a factored force of 800kN. Design the Butt joint. Arrange the bolts in diamond pattern. [8]
b) Find the efficiency of the Butt Joint. [2]
12. a) The tension member of a roof truss consists of 2 angles ISA 80 x 50 x 8 mm with longer legs welded on either side of a gusset plate 12 mm thick. The member is subjected to a factored tensile force of 275kN. Design a fillet weld connection. Assume shop welding. [5]
b) A tie member ISA 80mm x 50mm x 8mm of Fe410 grade is welded to a 12 mm thick gusset plate at site. Assuming welds on two sides, design the welds to transmit a load equal to the design strength of the member. [5]
13. a) Define net sectional area of a tension member. [1]
b) Design a tension member of a roof truss to carry a factored tensile force of 180kN. The length of the member is 3.0m. Use single angle and 4Nos M22 bolts of grade 4.6 for the connection. [9]
14. a) Design a laced built up column 10m long to carry a factored axial load of 1100kN. The Column is restrained in position but not in direction at both ends. Design the column with two channels back to back. [4]
b) Design single lacing system with bolted connection for column in 14 a. [6]

Contd...2

15. a) A simply supported beam of span 6m carries a udl of 80kN/m. Design the beam if it is laterally supported. Take grade of steel as Fe410. Use limit state method. [6]
- b) Check the beam for deflection and web buckling. [4]
16. a) The trusses for a factory building are spaced 3m c/c and the purlins are spaced at 1.2m c/c. The pitch of truss is $\frac{1}{4}$ and span of roof is 16m. The vertical load from roof sheets is 3000N/m² and wind load normal to roof is 1600N/m². Design an I-section purlin. [8]
- b) Check the purlin for deflection. [2]
17. Answer any *two* of the following:
- a) Find the shape factor for a square section side 'a' with its diagonal parallel to the zz-axis. [5]
- b) Sketch a typical gusseted base for column and mark the parts therein. [5]
- c) Beam column connections. [5]
