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Question Paper Code: BST006



# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

M.Tech II Semester End Examinations (Supplementary) - January, 2019

Regulation: IARE-R16

## ADVANCED STEEL DESIGN

Time: 3 Hours

(STE)

Max Marks: 70

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Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

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### UNIT – I

- (a) What are the advantages and disadvantages of welded connections. [7M]

(b) An ISA 100×100×10mm carries a factored tensile force of 100kN. It is to be jointed with a 12mm thick gusset plate. Design a high strength bolted joint when slip is not permitted and slip is permitted. Use M16 bolts of grade 8.8 and Fe410 steel. [7M]
- (a) Discuss the shear failure of black bolts in bearing type bolted connections with sketches. [7M]

(b) Design a welded connection [three sides] for the tension member ISA 100 × 65 × 8mm subjected to 150 kN service load [Field weld]. [7M]

### UNIT – II

- (a) What are the different types of failures in tension members and explain it with neat sketches. [7M]

(b) Design an eccentric loaded welded connection between a column ISHB300@58.8kg/m and a bracket 10mm thick. Adopt maximum size of the shop welds possible. The load and the welds are in the same plane. The vertical and horizontal load at the top of the bracket at service are 200kN and 40kN (acting outwards) respectively. The distance of the vertical load from the centre of the column is 600mm. The grade of the structural steel is Fe410. Check the safety of the connection. [7M]
- (a) Explain the design procedure for laced columns in builtup column sections. [7M]

(b) Check the adequacy of the HSFG bolts of M16 with 10.9 property class bracket connection which is to resist a factored load of 190kN (Load perpendicular to line of bolts) at an eccentricity of 150mm from face of the column. Numbers of bolts in one line are seven with pitch and end distances 65mm and 45mm respectively. Assume grade of steel as Fe 590Mpa. [7M]

### UNIT – III

5. (a) Design the members AB and AC at joint A of a roof truss, of slope  $26^{\circ}34'$  apart for the following data in given Table 1. [7M]

Table 1

Member	Length	Compressive force	Tensile force
AB	2.3 m	75kN	55kN
AC	1.8 m	60kN	80kN

- (b) Design the welded connection at joint A. Use tubes of grade Yst 210 for the data given in Table 1. [7M]
6. (a) Design the members of a roof truss shown in Figure 1 for the factored forces indicated. [7M]
- (b) Design the connection at left support and sketch the details. All the forces indicated are factored load as shown in Figure 1. [7M]

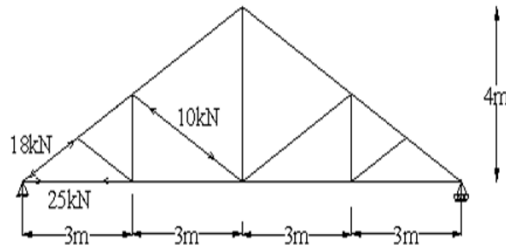


Figure 1

### UNIT – IV

7. (a) With the help of neat sketches explain the types of truss bridges. [7M]
- (b) A simply supported steel joist of 4m effective span is laterally supported throughout. It carries a total uniformly distributed load of 40kN (inclusive of self weight). Design an appropriate section using steel of Fe410. [7M]

8. (a) Write short notes on different loads acting on the roof truss. [7M]  
(b) Design an I section purlin, for an industrial building situated in the outskirts of Hyderabad to support a galvanised corrugated iron sheet roof for the following data (use ISWB150@166.77 N/m) [7M]  
Spacing of truss  $c/c=6\text{m}$   
Span of truss  $=12\text{m}$   
Slope of truss  $=30^\circ$   
Spacing of purlins  $c/c=1.5\text{m}$   
Intensity of wind pressure  $=2\text{kN}/\text{m}^2$   
Weight of galvanised sheets  $=130\text{N}/\text{m}^2$   
Grade of steel = Fe410

**UNIT – V**

9. (a) Explain with neat sketch the design of silo's by airy's method. [7M]  
(b) Design a strut in a roof truss for the following data [7M]  
Length of strut  $=2.234\text{m}$   
Factored compressive force  $=50\text{kN}$  (due to DL and LL)  
Factored tensile force  $=17.8\text{kN}$  (due to DL and WL)  
Grade of steel = Fe410  
Grade of bolts = 4.6  
Bolt diameter  $=20\text{mm}$
10. (a) Explain the factors affecting design of bins by considering different design parameters. [7M]  
(b) Write the procedure followed in the design of Bunkers as per Indian standards. [7M]

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