

**INSTITUTE OF AERONAUTICAL ENGINEERING**  
(AUTONOMOUS)

Code No: **BST006**

**MODEL QUESTION PAPER - II**

M.Tech II Semester Regular Examinations, APRIL 2017

**ADVANCED STEEL DESIGN**  
(STRUCTURAL ENGINEERING)

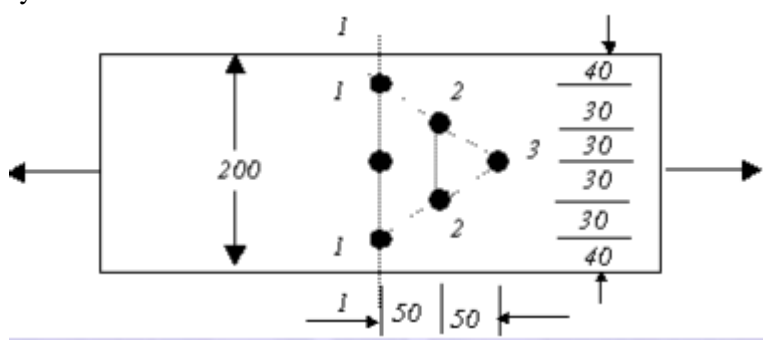
Time: 3 hours

Max. Marks: 70

Answer ONE Question from each Unit  
All Questions Carry Equal Marks

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

- 1.(a) Determine the design tensile strength of the plate (200 X 10 mm) with the holes as shown below, if the yield strength and the ultimate strength of the steel used are 250 MPa and 420 MPa and 20 mm diameter bolts are used.  
 $f_y = 250 \text{ MPa}$   $f_u = 420 \text{ MPa}$



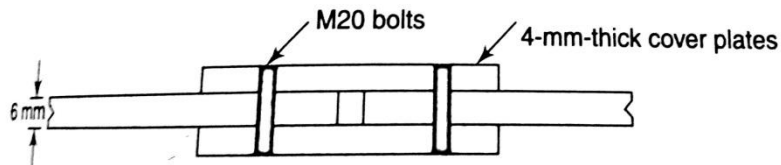
[8]

- (b) Write short notes on (any two) :
- (a) Sway Bracings.
  - (b) Rocker Bearings.
  - (c) Disadvantages of Riveted Connections
- (or)

[6]

- 2.(a) Write about different types of failure of bolted joints with the help of figures
- (b) A single bolted double cover butt joint is used to connect two plates 6mm thick. Assuming the bolts of 20mm diameter at 60mm pitch calculate the efficiency of the joint. Use 410MPa plates and 4.6 grade bolts.

[7]



[7]

- 3.(a) Design a beam to span 5m carrying a load of 5kN/m inclusive of self-weight. The ends of the beam are unstrained against lateral bending. Take  $f_y = 235 \text{ N/mm}^2$
- (b) What are the different types of beam column connections?

[6]

[8]

(or)

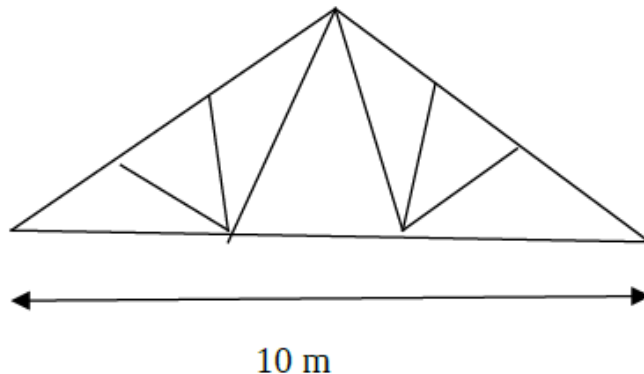
- 4.(a) Two secondary beams ISMB 400 @61.6 kg/m transmits a reaction of

[7]

225kN to either side of a girder ISMB 600@ 122.6kg/m. Design double fillet shop welded web connection.

- (b) A beam ISMB 400 @ 61.6 kg/m transmits an end shear of 150kN to the flange of a stanchion ISHB 300 @ 58.8 kg/m. Design an un-stiffened welded seat connection using shop welds. [7]

- 5.(a) A shed is proposed to be constructed at Chennai. The slope of the roof truss is corresponding to a pitch of 1/4. The average height of the roof above the ground is 15m. The life of the structure is expected to be about 50 years. The terrain has less obstruction. The cladding length is in between 30m to 40 m. the permeability of the truss is assumed to be medium. Calculate the various loads on the truss. The roof covering is GI sheeting.



[8]

- (b) Describe the components of a roof truss with neat diagrams. [6]  
(or)

- 6.(a) Write on the dead loads, snow loads, wind loads and imposed loads considerations for design of roof trusses. [7]

- (b) Design a purlin for a roof truss having the following data:  
Span of the truss = 6.0m, Spacing of truss = 3m c/c,  
Inclination of roof = 30°  
Spacing of Purlin = 2m c/c [7]  
Wind pressure = 1.5 kN/m<sup>2</sup>. Roof coverage = A.C  
Sheeting weighing 200 N/m<sup>2</sup>, Provide a channel section Purlin.

- 7.(a) A deck type 'N' truss bridge has 10 equal panels of 4m each with depth of truss 4m. The dead load & live load intensities are 30 KN/m & 40 KN/m respectively. [6]

Draw influence line diagram for members at top panel point from left end of truss. Using impact factor 0.40 design top chord section

- (b) Describe the joints in compression members of railway bridges. [8]

(or)

- 8.(a) A Pratt truss girder through bridge for single broad gauge track has an effective span of 30m. The truss girder has 6 panels of 5m each. The cross girders are spaced 5m apart while the stringers are spaced 2m between centre lines. The sleepers are spaced 30cm from centre to centre and has a size of 28mx250mmx200mm, made of timber weighing 7.5kN/mm<sup>2</sup>. The weight of stock rails and check rails may be taken as 0.6 and 0.4 kN per metre. The c/c/ spacing of main girders is 7m. Design for the central panel, the top chord member, bottom chord member and verticals and diagonals. Also design the joint. Take height of the girder between C.G. of chord as 6.5m. [7]

- (b) Determine the decrease or increase of forces in central chord members of the leeward truss-girder in the following case: [7]
- a) Overturning effect due to wind, when the bridge is loaded.
  - b) Lateral effects of top and bottom chord bracings when the bridge is loaded
- 9.(a) What are the problems concerned with the design of storage hoppers? [7]
- (b) Explain about design of Silos by using AIRY's method. [7]
- (or)
- 10.(a) Give a detailed description of the different designs of hoppers. [6]
- (b) Write the step wise procedure followed in the design of Bins [8]