**A**            **R7908**            **Pages: 2**

Reg No.:_____           Name:_____

### APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
SEVENTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018
**Course Code: CE401**
**Course Name: - DESIGN OF STEEL STRUCTURES**

Max. Marks: 100                                              Duration: 3 Hours

*(Use of IS800, IS875, IS883 are permitted)*

### PART A
*Answer any two full questions, each carries 15 marks.*       Marks

1 a) Explain the failures of bolted joints.                               (5)

    b) Design a lap joint between the two plates of width 150 mm, if the thickness of    (10)
one plate is 12 mm and the other is 10 mm. The joint has to transfer a working
load of 100 kN. The plates are of Fe 410 grade. Use bearing type bolts.

2 a) Write any six features of structural steel                            (3)

    b) An ISMC 250 @ 298kg/m is used as a tie member to transmit a factored load of    (12)
800kN. The channel section is connected to a gusset plate of 10mm thickness.
Design a fillet weld if the lap length is limited to 300mm. Provide slot welds if
required.

3 a) With the help of suitable diagram, explain the concept of shear lag.         (3)

    b) Design a suitable double angle section to carry a factored tensile load of 450 kN.    (12)
The length of the member is 2.9m.Use M20 bolts of 4.6 grade. The grade of steel
is Fe410.

### PART B
*Answer any two full questions, each carries 15 marks.*

4 a) Design a built-up column consisting of two channels placed back to back to    (15)
carry an axial factored load of 1900kN. Design bolted single lacing system also.
Length of the column is 10m and both the ends of the column are effectively
restrained in direction and position

5 a) Briefly describe the types of foundations used for columns.            (5)

    b) Design a gusseted base for a column ISHB 350 @72.4 kg/m with flange plates    (10)
450 × 20mm carrying a factored axial force of 3000kN. The column rests on
M20 grade concrete pedestal. Design the bolted connection also. Assume Fe 410
grade steel and 4.6 grade bolts.

6   a)   Distinguish between laterally restrained and unrestrained beams.      (4)

     b)   A conference hall 8mx12m is provided with a 120 mm RCC slab over rolled    (11)
steel I beams spaced 4m centre to centre. The super imposed load is 4kN/m$^2$ and
floor finish of 1.5 kN/m$^2$. Design one of the beam as laterally supported.

## PART C
### *Answer any two full questions, each carries 20 marks.*

7   a)   A roof truss shed is to be built in Chennai for an industry .The size of shed is    (5)
20mx8m.The height of building is 10m at the eaves. Determine the basic wind
pressure.

     b)   A purlin is to be designed to support a GI sheet as roofing material for a truss    (15)
spaced at 3.5m c/c. purlin along the principal rafters are arranged at a  distance
of 1.35mc/c. The pitch of truss is 0.2m. Design a section for the purlin. Assume
basic wind speed as 44m/s.

8        Design a fan type roof truss for a span of 9m, with 4m spacing, using GI sheets.    (20)
Slope of rafter 30$^0$. The wind pressure is 1.15kN/m$^2$

9   a)   Find the safe axial load of a column, made of salwood, of size 200mm x200mm    (5)
for inside location having an unsupported length of 5m

     b)   What are the deflection considerations for the design of timber structures.    (5)

     c)   A flitched beam is made of timber joists 100mm x 220mm with a steel plate of    (10)
size 20mm x 160mm placed symmetrically between them and firmly attached to
both.. Calculate the moment of resistance of the combined section when the
maximum bending stress in timber is 8N/mm$^2$. Take Es= 20 Ew

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