

Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
SEVENTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019

**Course Code: CE401**

**Course Name: - DESIGN OF STEEL STRUCTURES**

Max. Marks: 100

Duration: 3 Hours

*(Use of IS 800, IS875, IS883 are permitted. Assume suitable data wherever necessary)*

**PART A**

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

- |  | Marks |
|--|-------|
| 1 a) What do you mean by prying forces?  | (3)   |
| b) Design a double cover joint between the two plates of width 300 mm, if the thickness of one plate is 18 mm and the other is 10 mm. The joint has to transfer a working load of 260 kN. The plates are of Fe 410 grade. Use bolt of grade 4.6. | (12)  |
| 2 a) A tie member of a roof truss consisting of an angle section ISA 75 x75x10 of Fe 410 grade, is welded to a 10mm thick gusset plate. Design a weld to transmit a load equal to full strength of the member. Assume shop welding.              | (10)  |
| b) Under what circumstances do we use slot welds and plug welds?   | (2)   |
| c) Explain block shear failure.  | (3)   |
| 3 a) What is a lug angle?  | (3)   |
| b) Design a bridge truss diagonal carrying a pull of 200kN using double angle section. The centre to centre distance of intersections is 3m. The member is subjected to reversal of stresses.  | (12)  |

**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 carry an axial factored load of 1500 kN. Length of the column is 6m and the column is restrained in position but not in direction at both ends. Provide single lacing system with bolted connection. | (13) |
| b) What are the main purpose of lacings and battens?   | (2)  |
| 5 a) Illustrate the different elements of plate girder.  | (5)  |
| b) Design a suitable slab base for a column section ISHB 200@ 365.9N/m supporting an axial load of 500 kN. The base plate is to rest on a concrete pedestal of M20 grade   | (10) |

concrete. The load is transferred to the base plate by welded connection.

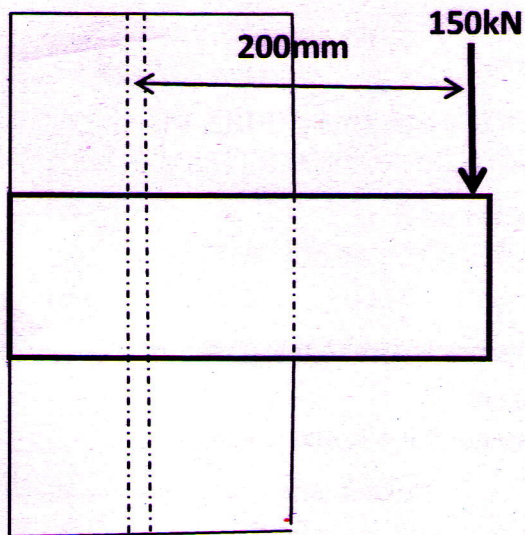
- 6 a) What is lateral torsional buckling of beams? (2)
- b) Design the simply supported main beam of a building supporting concrete floor slab with (13)  
the following data:
- Centre to centre distance of beams – 6m
- Span of beam – 7m
- Thickness of concrete slab – 240mm
- Finished screed – 40mm thick
- Weight of concrete slab and finished screed-  $24\text{kN/m}^3$
- Imposed load –  $4\text{kN/m}^2$

### PART C

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

- 7 a) Design a purlin on a sloping roof truss with the dead load of  $0.15\text{ kN/m}^2$ , a live load of  $2.5\text{ kN/m}^2$  and a wind load of  $0.6\text{ kN/m}^2$  (suction). The purlins are 1.8m centre to centre and a span of 3.8m, simply supported on a rafter at a slope of  $20^\circ$ . (16)
- b) A roof truss has a span of 20m and a rise of 4m is placed at 3.5m c/c. calculate the live load on the roof truss. (4)
- 8 a) The details of a shed situated in Thiruvananthapuram is given below (10)
- Span of truss – 15m
- Rise of truss – 4m
- Eaves height – 8m
- Spacing of truss – 3m
- Spacing of purlin – 4m
- Find the design wind pressure and wind load on purlin.
- b) Design the bracket connection shown below. The connection supports a load of 150kN. (10)
- The column section is ISHB 150@ 300.19N/m. The thickness of bracket plate is 10mm.
- Use M16 bolts of grade 4.6.





- 9 a) Design a beam of clear span 4m at spacing of 2 m centre to centre in a roof for a residential building. The bearing at each end is 250 mm . The dead load of roof covering is  $1.5 \text{ kN/m}^2$  and live load is  $3 \text{ kN/m}^2$ . Assume that deodar wood is used. (15)
- b) Explain briefly classification of timber. (5)

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