

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

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

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

Seventh Semester B.Tech Degree Examination (Regular and Supplementary), December 2020

**Course Code: CE401****Course Name: DESIGN OF STEEL STRUCTURES****(Use of IS 800, IS 875, IS 883 are permitted. Assume suitable data wherever necessary)**

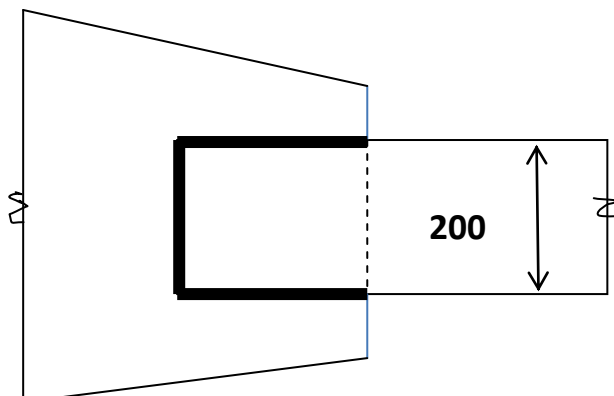
Max. Marks: 100

Duration: 3 Hours

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

Marks

- 1 a) What are the three classifications of loads as per IS 800: 2007 (3)
- b) Two flat plates (Fe 410 Grade Steel), each 240 mm x 10mm are to be jointed (12)  
using 20 mm diameter, 4.6 grade bolts, to form a lap joint. The joint is supposed  
to transfer a working load of 200 kN. Design the joint and also find the efficiency  
of joint.
- 2 a) An ISLC 350 @38.8kg/m is used to transmit a factored force of 1000kN. The (10)  
channel section is connected to a gusset plate 12 mm thick. Design a fillet weld if  
the overlap is limited to 350 mm. Use slot welds if required.
- b) A tie member in a truss girder is 200 mm x 14 mm in size. It is welded to a 10mm (5)  
thick gusset plate by a fillet weld. The overlap of the member is 350 mm and the  
weld size is 6 mm. Determine the design strength of the joint



- 3 a) Design a single angle tension member subjected to a factored tensile load of (12)  
270kN. The length of the diagonal is 3.0 m. The tension member is connected to a

gusset plate 12 mm thick with one line of 20 mm diameter bolts of grade 4.6. Use steel of grade Fe 410.

- b) Explain shear lag effect. (3)

**PART B**

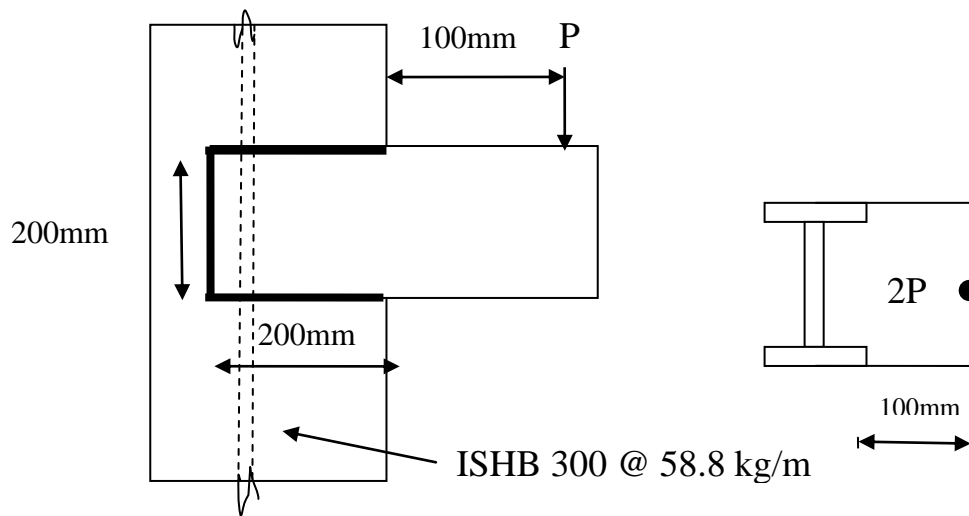
*Answer any two full questions, each carries 15 marks.*

- 4 a) Design a column to support a factored load of 1100 kN. The column has an effective length of 7.0 m with respect to z-axis and 4.5 m with respect to y-axis. Use steel of grade Fe 410. (10)
- b) Design a suitable slab base for a column section ISHB 350@ 710.2N/m supporting an axial load of 1000 kN. The base plate is to rest on a concrete pedestal of M20 grade concrete. The load is transferred to the base plate by direct bearing of column flanges. Use steel of grade Fe 410. (5)
- 5 Design a built-up column consisting of two channels placed back-to-back to carry an axial factored load of 1600 kN. Length of the column is 7m and the column is restrained in position but not in direction at both ends. Also design the bolted lacing system. Use grade Fe 410. (15)
- 6 a) A conference hall 8m x 18m is provided with a RCC slab over rolled steel beams spaced 3m centre to centre. Design the simply supported main beam supporting concrete floor slab if thickness of concrete slab is 120mm and a wearing coat of 40mm thick is provided over the slab. Weight of concrete slab and wearing coat is  $24\text{kN/m}^3$ . (12)
- b) List the different elements of a welded plate girder. (3)

**PART C**

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

- 7 a) A bracket plate is used to transfer the reaction of a beam to a column flange as shown in Fig. The bracket plate is connected to the column flange by a 6 mm fillet weld. Compute the maximum load that can be placed over the bracket plates at a distance of 100 mm from the flange of the column section. (10)



- b) A roof truss has a span of 12m and a rise of 2.5m is placed at 4m c/c. Calculate the live load on the roof truss. (4)
- c) Determine the design wind pressure on a pitched roof near Pune (6)

Given Structure:

An industrial shed situated on flat terrain with sparsely populated buildings.

The span of roof truss is 18 m and rise is 3 m

Height of building at eaves: 10 m

- 8 a) A deodar wood column of 3m unsupported length has a cross section of 150mm x 200mm. Calculate the safe axial load carrying capacity of column when used for outside location. (6)
- b) Design an I section purlin for an industrial building with Galvanised iron sheets as the roofing material. (14)

Spacing of trusses = 6m c/c

Spacing of purlins = 1.5m c/c

Inclination of main rafter to horizontal -  $30^\circ$

Wind pressure =  $2 \text{ kN/m}^2$

Live load =  $1 \text{ kN/m}^2$

Weight of GI sheets =  $130 \text{ N/m}^2$

Grade of steel : Fe 410

- 9 a) Design a Sal wood timber joist of clear span 6m placed at centre to centre spacing of 3m in a roof. The bearing at each end is 30cm. The dead load of roof covering is  $1.5 \text{ kN/m}^2$  and live load is  $3 \text{ kN/m}^2$  (15)
- b) Classify the timber based on modulus of elasticity, durability, and treatability. (5)

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