

Gandhi Institute of Engineering and Technology University, Odisha, Gunupur (GIET University)



B. Tech (Sixth Semester - Regular) Examinations, April 2026

23BCVPC36001- Design of Steel Structures

(Civil Engineering)

(IS 800:2007 Code Book and Steel Table is allowed in the Examination)

Time: 3 hrs

Maximum: 60 Marks

Answer ALL questions

(The figures in the right hand margin indicate marks)

PART – A

(2 x 5 = 10 Marks)

Q.1. Answer **ALL** questions

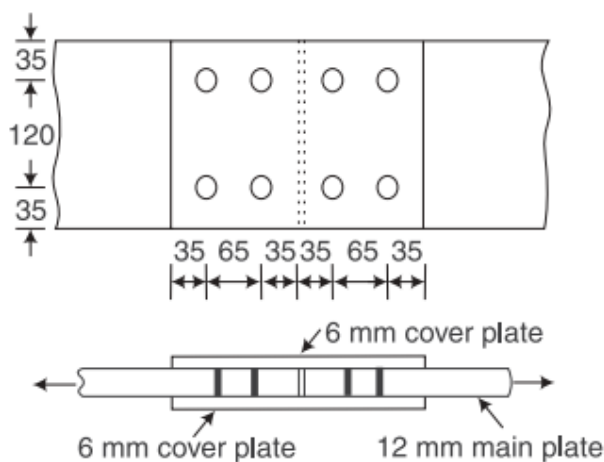
- | | CO # | Blooms Level |
|--|------|--------------|
| a. Discuss the advantages and disadvantages of welded connections in structural engineering. | CO1 | K2 |
| b. Explain the main purpose of using a plate girder instead of a rolled beam. | CO6 | K2 |
| c. Determine the minimum pitch and minimum end distance for 20 mm diameter bolt. | CO2 | K3 |
| d. State the formula for determining the slenderness ratio of a battened column. | CO4 | K2 |
| e. State the formulas of web crippling strength due to concentrated load and due to support. | CO5 | K2 |

PART – B

(10 x 5 = 50 Marks)

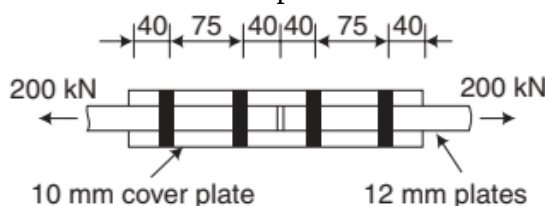
Answer **ALL** the questions

- | | Marks | CO # | Blooms Level |
|--|-------|------|--------------|
| 2. a. Compute the design strength of bearing-type connections based on shear and bearing for the joints shown in figure. The bolts are of grade 4.6 and 16 mm in diameter. | 10 | CO1 | K3 |



(OR)

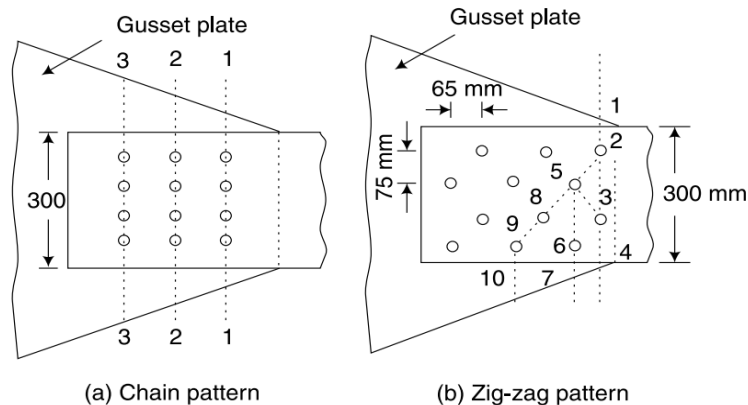
- | | | | |
|---|----|-----|----|
| b. Determine the total number of 24 mm diameter bearing-type bolts required for the double-bolted double-cover butt joint shown in figure. The threads of bolts may be assumed not to fall in the shear planes. | 10 | CO1 | K3 |
|---|----|-----|----|



- 3.a. A single unequal angle ISA10065, 8 mm is connected to a 10 mm gusset plate at the end with 5 numbers of 16mm bolts ($p=50$ mm, $e=30$ mm) to transfer tension. Determine the tensile strength of the angle if the gusset plate is connected to 100 mm leg.

(OR)

- b. A 300 ISF 8 mm of grade Fe 410 is used as a tension member in a lattice girder. It is connected to a 12 mm thick gusset plate by 18 mm diameter bolts of grade 4.6. Calculate the effective net area of the member, if
(a) chain bolting is done as shown in Figure a
(b) zig-zag bolting is done as shown in figure b



- 4.a. Design a laterally supported beam of effective span 5m for the following data.
Factored maximum Bending Moment = 250 kNm
Factored maximum Shear force = 300kN
Check for deflection is not required.

(OR)

- b. Evaluate the design bending strength of ISLB 350 @ 49.5 kg/m considering the beam to be laterally unsupported. The design shear force V is less than the design shear strength. The unsupported length of the beam is 4.0 m. Assume steel of grade Fe 410.
- 5.a. Determine the load carrying capacity of a compound column consisting ISMB 350@52.4kg/m with one cover plate of 250 x 20 mm on each flange and having a length of 4 m. One end of the column is fixed and other end is pinned.

(OR)

- c. A column 6m long is effectively held in position and restrained against rotation at both ends, carries a working load of 700 kN. Use beam I section for design.
- 6.a. Design the lacing bar connected in a built-up column 7m long to carry factored axial load of 1200 kN. The column is effectively held in position at both ends and restrained against rotation at one end. The columns are placed with two ISMC 300 channels placed back to back. Provide single lacing system with bolted connection.

(OR)

- c. Write short notes on web crippling with neat sketches.
- d. Describe the various types of stiffeners and their specific functions in a plate girder.

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