BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI (END SEMESTER EXAMINATION)

CLASS: BARCH SEMESTER: VI BRANCH: ARCH. SESSION: SP/19

SUBJECT: AR6309 STEEL STRUCTURES

TIME: 3.00 Hrs. FULL MARKS: 60

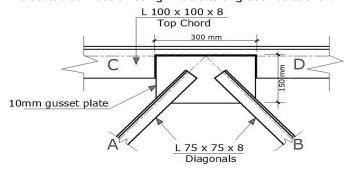
INSTRUCTIONS:

- 1. The question paper contains 7 questions each of 12 marks and total 84 marks.
- 2. Candidates may attempt any 5 questions maximum of 60 marks.
- 3. The missing data, if any, may be assumed suitably.
- 4. Before attempting the question paper, be sure that you have got the correct question paper.
- 5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

- Q.1(a) Draw & explain the stress strain graph for mild steel.
 Q.1(b) Determine the collapse/ultimate load for a fixed beam of span L, subjected to a concentrated load W [6] at mid-span by (i) static & (ii) kinematic method.
- Q.2(a) An ISA 100mm x 100mm x 10mm carries a factored tensile force of 100 kN. It is joined to a 12mm thick [8] gusset plate. Design a bolted joint using HSFG bolt of grade 8.8 & 16 mm diameter, when (i) no slip is permitted & (ii) slip is permitted. Steel is of grade Fe 410. Draw relevant labeled figures. Block shear strength of joint need not be considered.
- Q.2(b) Two plates of 16 mm & 14 mm thickness are joined by a groove weld. The joint is subjected to a [4] factored tensile force of 430 kN. Effective length of the weld is 175 mm. Check safety of the joint if single V groove weld is provided. Draw relevant labeled figures.
- Q.3 A single unequal angle ISA 100mm x 75mm x 6mm is connected to a 10mm thick gusset plate at the [12] ends to transfer tension with 6, M16 bolts of grade 4.6 arranged in a single row. Determine design tensile strength of the angle if the gusset is connected to the 100mm leg of the angle.
- Q.4(a) A column ISHB 300 @ 576.8 N/m is to support a factored load of 900 kN. Column section is to be spliced [6] at a height of 2.5m. Design the splice plate. Draw relevant labeled figures.
- Q.4(b) Calculate the design compressive load for a stanchion ISHB 350 @ 710.24 N/m, which is 3.5m high. [6] Column is restrained in direction & position at both ends.
- Q.5(a) Determine the design bending strength of ISLB 350 @ 486 N/m considering the beam to be laterally [6] supported. Effective length of the beam is 3m. Assume it as a case of low shear.
- Q.5(b) A laterally supported steel joist comprise of ISLB 175 @ 163.83 N/m. The maximum shear force in the [6] beam is 30 kN. Perform the web crippling check for this beam section.
- Q.6 Design a slab base for the column ISHB 350 @ 710.2 N/m subjected to a factored axial compressive [12] load of 1500 kN for the following conditions:-
 - (i) load is transferred to the base plate by direct bearing of column flanges $\ensuremath{\mathfrak{t}}$
 - (ii) load is transferred to the base plate by welded connections when column end & base plate are not machined for bearing.
 - The base rests on a concrete pedestal of grade M20. Are anchor bolts required? Draw relevant labeled figures.

[6]

- Q.7(a) Discuss the various loads that roof trusses are subjected to.
- Q.7(b) Design member A & B in a bolted connection using M16 bolts of grade 4.6 as shown in the figure below:- [6]



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