

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

**CLASS: BARCH
BRANCH: ARCH.**

**SEMESTER : VI
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.
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- Q.1(a) Draw & explain the stress - strain graph for mild steel. [6]
- Q.1(b) Determine the collapse/ultimate load for a fixed beam of span L , subjected to a concentrated load W at mid-span by (i) static & (ii) kinematic method. [6]
- 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 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. [8]
- Q.2(b) Two plates of 16 mm & 14 mm thickness are joined by a groove weld. The joint is subjected to a 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. [4]
- Q.3 A single unequal angle ISA 100mm x 75mm x 6mm is connected to a 10mm thick gusset plate at the 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. [12]
- 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 at a height of 2.5m. Design the splice plate. Draw relevant labeled figures. [6]
- Q.4(b) Calculate the design compressive load for a stanchion ISHB 350 @ 710.24 N/m, which is 3.5m high. Column is restrained in direction & position at both ends. [6]
- Q.5(a) Determine the design bending strength of ISLB 350 @ 486 N/m considering the beam to be laterally supported. Effective length of the beam is 3m. Assume it as a case of low shear. [6]
- Q.5(b) A laterally supported steel joist comprise of ISLB 175 @ 163.83 N/m. The maximum shear force in the beam is 30 kN. Perform the web crippling check for this beam section. [6]
- Q.6 Design a slab base for the column ISHB 350 @ 710.2 N/m subjected to a factored axial compressive load of 1500 kN for the following conditions:- [12]
(i) load is transferred to the base plate by direct bearing of column flanges &
(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.
- Q.7(a) Discuss the various loads that roof trusses are subjected to. [6]
- 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]

