

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- 2025

B.Tech-VI Semester (CE)

COURSE CODE (CREDITS): 18B11CE612 (3)

MAX. MARKS: 15

COURSE NAME: Design of Steel Structures

COURSE INSTRUCTORS: Dr. Kaushal Kumar

MAX. TIME: 1 Hour

**Note:** (a) Q4, Q5, Q6 are compulsory. Attempt any two questions from Q1, Q2 and Q3.

(b) IS-800:2007 is allowed, sharing of code, calculator or stationary material is strictly prohibited.

Q.No	Question	CO	Marks
Q1	Discuss the major advantages and disadvantages of steel structures, comparing them with other materials like concrete and timber.	CO-1	3
Q2	Explain in detail the three major design philosophies used in steel structures: a) Working Stress Method (WSM) b) Limit State Method (LSM) c) Plastic Design Which method is most commonly used in modern steel design and why?	CO-1	3
Q3.	Explain the failure modes of bolted connections, including shear failure, bearing failure, and block shear failure. Support your explanation with relevant equations and sketches.	CO-1	3
Q4.	A lap joint is made using M18 black bolts (4.6 grade) to connect two steel plates of thickness 12 mm. The joint is subjected to a factored tensile force of <b>250 kN</b> . Given that the plate material is Fe410 steel, determine the number of bolts required considering failure due to shear and bearing. Assume suitable design values as per IS 800.	CO-1, CO-2	3
Q5.	A bracket connection is fixed to a steel column using six bolts in two vertical rows with a spacing of 80 mm. A vertical force of 60 kN acts at an eccentricity of 250 mm from the column face. Determine the force on the most stressed bolt, considering the effect of direct and moment-induced forces.	CO-1, CO-2	3
Q6.	A double cover butt joint is used to connect two plates of 10 mm and 18mm thickness respectively using M20 black bolts (4.6 grade). A packing plate of 8 mm thickness is placed between the main plates and the cover plates. The joint is subjected to a factored tensile force of <b>300 kN</b> .  Considering the effect of the packing plate on bolt strength, determine the number of bolts required for a safe connection based on shear and bearing failures. Assume Fe410 steel for the plates and refer to IS 800 for necessary design values.	CO-1, CO-2	3