BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION SP/2023)

CLASS: B.TECH/B.ARCH   SEMESTER : VI
BRANCH: CIVIL/ARCHITECTURE   SESSION : SP/2023

SUBJECT: CE308 STRUCTURAL DESIGN - II
TIME: 02 HOURS   FULL MARKS: 25

INSTRUCTIONS:
1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates

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			CO	BL
Q.1(a)	Write two advantages and two disadvantages of structural steel.	[2]	1	K1
Q.1(b)	Sketch the typical stress-strain curve of mild steel, indicating the three important region.	[3]	1	K2

Q.2(a)   A roof truss has a span of 12 m and a height of 2.4m which is placed at 3.5m c/c. Calculate   [2]   1   K3
the live load on the roof truss.

Q.2(b)   A rectangular building having plan dimensions of 10 m x 50 m and height 5 m, is situated   [3]   1   K3
in Ranchi in an upcoming institutional complex on a fairly levelled topography. The
building has a flat roof supported on load bearing walls. Calculate the design wind speed
and design wind pressure for the given scenario. Consider basic wind speed at Ranchi as
V_b = 39 m/s, Risk factor k1 = 1.00, terrain and height factor k2 = 1.00, topography factor
k3 = 1.0, importance factor k4 =1.30, wind directionality factor Kd = 0.9, area averaging
factor Ka = 0.867 and combination factor Kc = 0.9.

Q.3(a)   What does 4 and 6 imply for bolts of grade 4.6?   [2]   1   K1

Q.3(b)   A bracket plate bolted to a vertical column is loaded as shown in the following figure. If   [3]   3   K4
M20 bolts of grade 4.6 are used, determine the maximum value of factored load P which
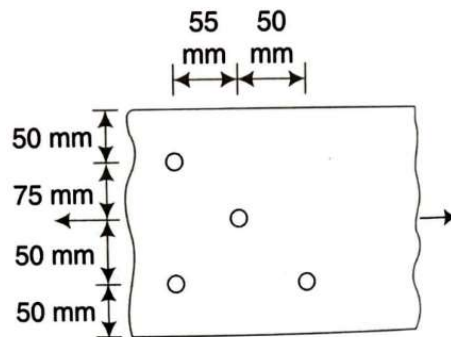can be carried safely. Assume grade of steel as E250 (f_u = 410 MPa).
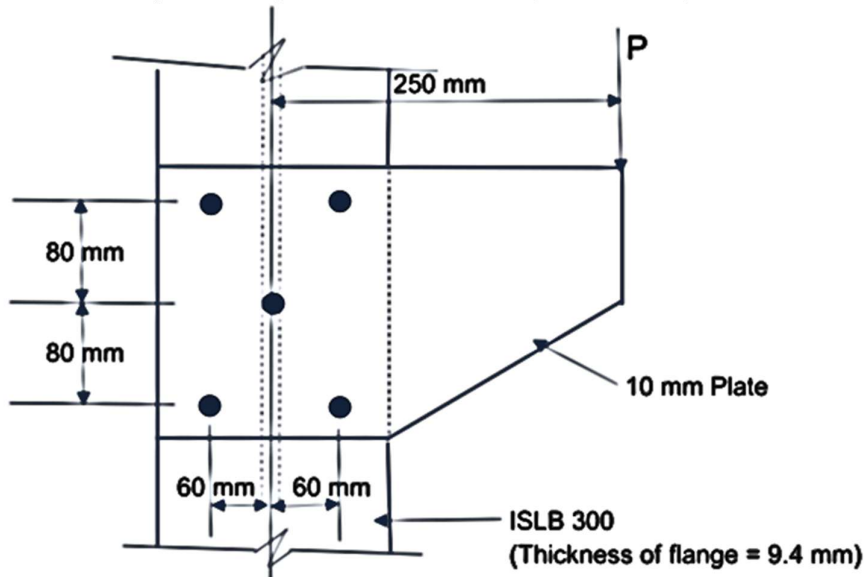
Q.4(a)   For fillet weld subjected to normal stress (f_a) and shear stress (q), what is the equivalent   [2]   1   K1
stress?

Q.4(b) A tie member of a truss consists of double angle section, each 80 mm x 80 mm x 8 mm [3] 3 K3
welded on the opposite side of a 12 mm thick gusset plate as shown in the following
figure. Design a fillet weld for making the connection in the workshop. The factored
tensile force in the member is 300 kN. Assume fu = 410 MPa.
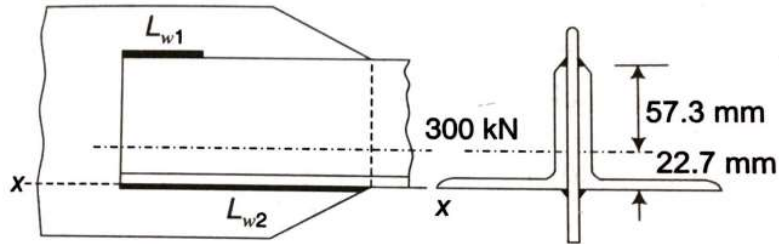
Q.5(a) Mention the modes in any of which a tension member may fail. [2] 1 K2
Q.5(b) Determine the net area of the 20 mm thick plate shown in the following figure. All holes [3] 3 K4
are 20 mm diameter.

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