KING SAUD UNIVERSITY   **STEEL STRUCTURES : CE 473**
COLLEGE OF ENGINEERING   **FIRST SEMESTER, 1428/1429 H**
CIVIL ENGINEERING DEPARTMENT   **TIME : 90 min**

FIRST MID TERM EXAM

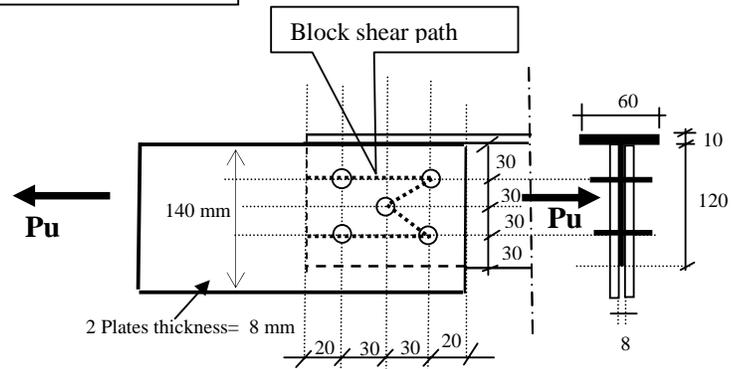**Answer all problems in the provided spaces**

Problem 1 :

A tension member made of T section was
connected to two plates of thickness 8 mm
each and width of 140 mm, as shown in figure.
The bolts used for the are M12, A325 bolts
with the shown arrangments.
(all dimensions in mm)

   For steel , Fy =250 MPa, Fu = 400 MPa
   For bolts : Fu = 620 MPa, Fv = 400 MPa

1- Determine the maximum tensile strength of the T-section , Consider

a) Yielding at A_g

b) Fracture at A_e
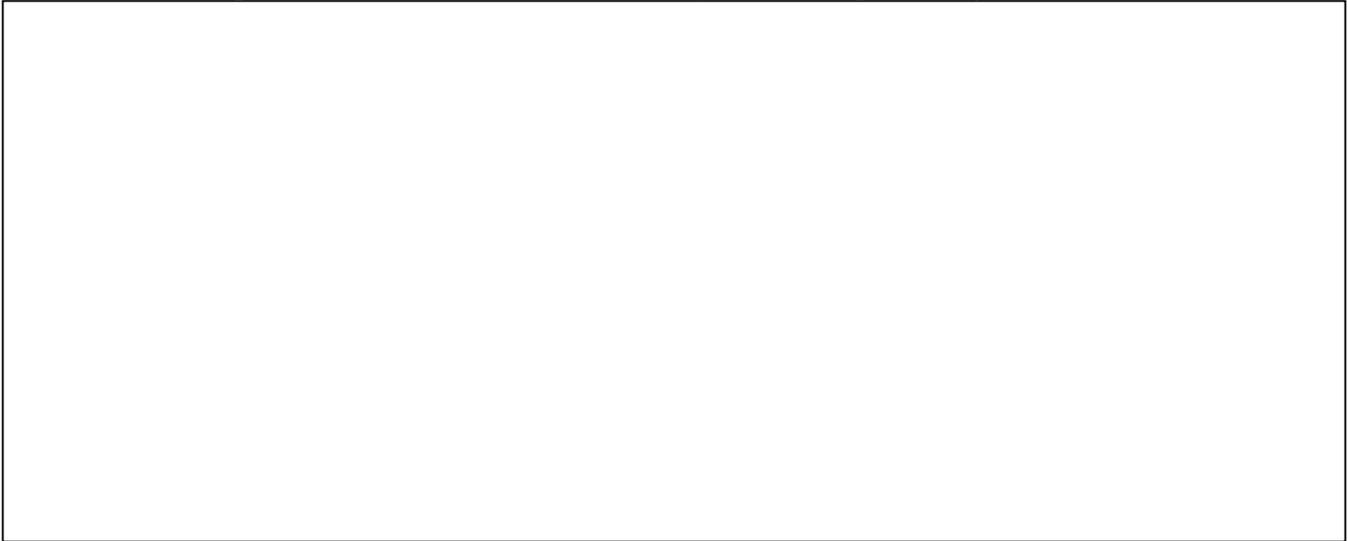
   i- Consider path 1-1

   ii- Consider path 2-2

Governing Tensile strength for fracture at A_e =

c) Block shear rupture **in web** of the T-section (use only the shown path on figure)

d) The governing Factored Tensile strength of T-section =

2- If the connection is considered to be slip critical connection, with standard holes and μ =0.50

a- Determine the factored slip critical strength of the bolts

b- Determine the factored shear strength of bolts

c- Determine the factored bearing strength of bolts

d- Factored strength of the connection

Problem 2 :

If the same T- section in problem 1, was spliced with 2 plates at web with thickness 8 mm and one plate at flange with thickness 10 mm , and using the shown arrangement of A325 bolts , M12

Pu

80

20
20
20
20

**Pu**

20 30 30 20
20 30 30 20

20

20
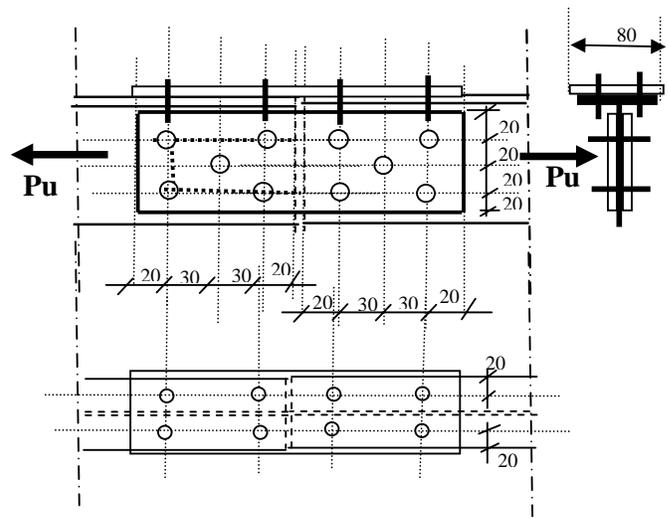
1- Determine the factored tensile strength of the T-section, considering only fracture at effective area

2- Would the block shear strength be changed from the value obtained in problem 1? Why, Explain?

Problem 3 :

If the two splice plates 80 mm wide were welded to the web of the T-section with both Longitudinal and transversal welds.
In addition, each flange was spliced with a 80 mm wide plate with only longitudinal welds of length equal 100 mm on each side.
All weld sizes are 6 mm and F_{E70}= 500 MPa

Longitudinal welds only

100   100

80

Pu   80   80   **Pu**

Transversal welds on both sides

140

Longitudinal welds on both sides
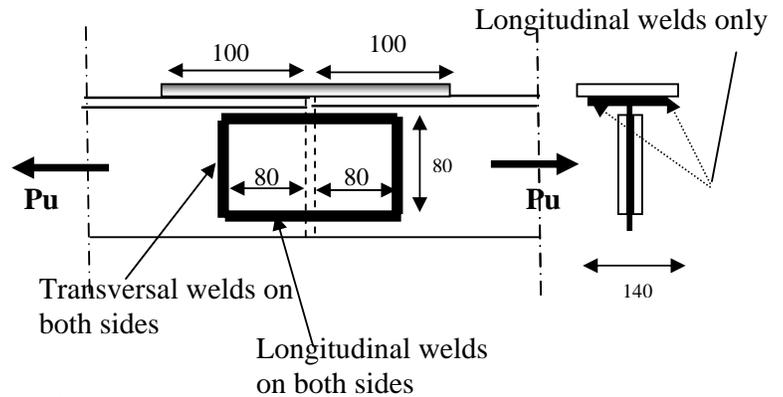
Determine the strength of welds **(consider only weld fracture)**

i- Factored strength of welds for **web**

ii- Factored strength of welds for **flanges**

iii- Factored strength of the group of welds