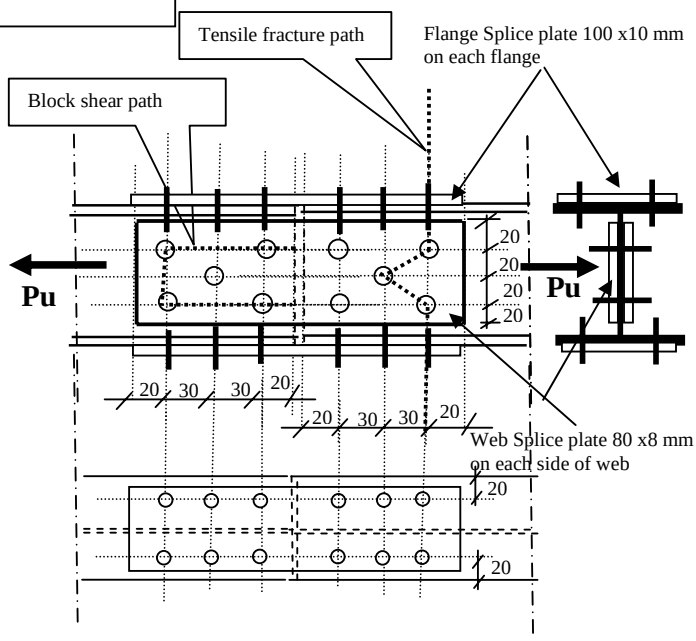
Name in Arabic : **Lecture time :**
Number in class :

KING SAUD UNIVERSITY **STEEL STRUCTURES : CE 473**
COLLEGE OF ENGINEERING **SECOND SEMESTER, 1427/1428 H**
CIVIL ENGINEERING DEPARTMENT **TIME : 90 min**

FIRST MID TERM EXAM

Answer all problems in the provided spaces

A tension member made of W 100x19.3 was spliced at web by using two plates of thickness 8 mm each and width of 80 mm with 5 M12, A325 bolts on each side of web , and spliced at flanges by one plate of thickness 10 mm and width 100 mm with 6M12 A325 bolts on each side of each flange, as shown in figure, (all dimensions in mm)
For steel , Fy =250 MPa, Fu = 400 MPa
For bolts : Fu = 620 MPa, Fv= 400 MPa
For W 100 x 19.3
A= 2480 mm^2
Flange width= 103 mm, flange thickness = 8.8 mm
Depth = 106 mm, Web thickness = 7.1 mm



Problem 1 :

1- Determine the maximum tensile strength of the W 100 x 19.2 , Consider

a) Yielding at A_g

b) Fracture at A_e (Consider the shown path for temsile fracture)

c) Block shear rupture in web of the W –shape (consider the given path for block shear)

d) Block shear rupture in flanges of the W –shape

Total Block shrear strength of W 100 x 19.2 =

Maximum Tensile strength of W 100x19.2 =

2- Determine the maximum strength of bolts, assume $\mu = 0.50$ and standard holes, Consider:

a) Slip-critical connection

- for web bolts

- for both flange bolts

- Total slip-critical strength of the splice

b) Bolt Shear failure

- For web bolts

- For both flange bolts

- Total bolt shear strength of splice

c) Bearing failure of plates

- For web bolts

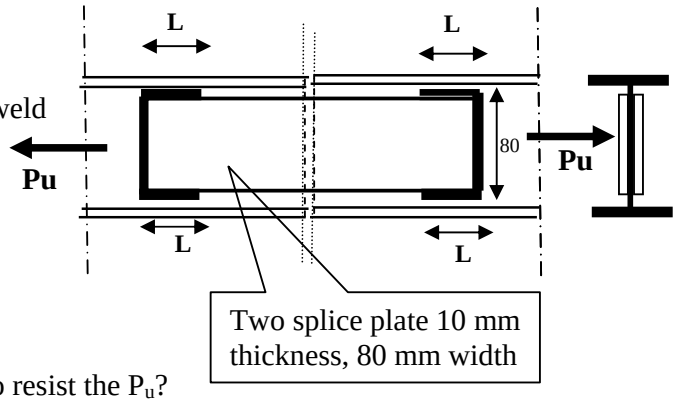
- For both flange bolts

- Total bearing strength of splice

d) Maximum strength of the solice connection

Problem 2 :

If the two splice plates 80x 10 mm were welded to the web of the W 100x 19.3 with a transversal weld of length equal 80mm, and size of 8mm, **on both sides**, as shown in figure, and if, P_u = 500 kN.and F_{E70}= 500 MPa



1- Will the transversal weld **only** be sufficient to resist the P_u? Consider,

a) Failure of transversal weld

b) Tensile fracture of web

Is the transversal weld sufficient? Why?

2- If the transversal weld in not sufficient to resist the P_u, what would be the required length of longitudinal weld (L) needed for the splice? Consider;

a) Failure of longitudinal weld

b) Shear fracture of web

Required length of longitudinal weld =