



**YILDIZ TECHNICAL UNIVERSITY  
DEPARTMENT OF CIVIL ENGINEERING  
CONSTRUCTION MATERIALS DIVISION**

**MATERIAL SCIENCE / LABORATORY REPORT 2: MECHANICAL PROPERTIES OF STEEL**

**Name-Surname:**

**Group:**

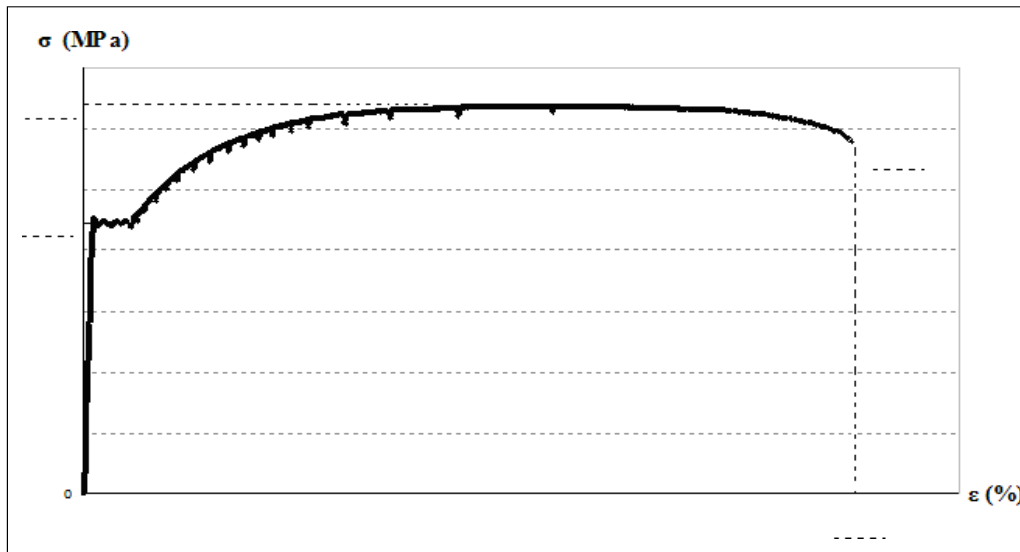
**Student No.:**

**Session:**

**TENSION TEST**

<b>Specimen</b>		Mild (Low Carbon) RC Steel
<b>Class / Type</b>		S420 / Ribbed
<b>Length (<math>l_{bar}</math>, cm)</b>		
<b>Diameter (<math>d_o</math>, mm)</b>		
<b>Load (P)</b>	<b><math>P_{yield}</math> (kN)</b>	
	<b><math>P_{max}</math> (kN)</b>	
	<b><math>P_{fracture}</math> (kN)</b>	
<b>Final Diameter (<math>d_f</math>, mm)</b>		
<b>Gauge Length (<math>l</math>)</b>	<b>Initial (<math>l_i=5d_o</math>, mm)</b>	
	<b>Final (<math>l_f</math>, mm)</b>	
<b>Yield Strength (<math>\sigma_y</math>, MPa)</b>		
<b>Tensile Strength (<math>\sigma_t</math>, MPa)</b>		
<b>Apparent Fracture Strength (<math>\sigma_{af}</math>, MPa)</b>		
<b>True Fracture Strength (<math>\sigma_{tf}</math>, MPa)</b>		
<b>Ductility (<math>\epsilon_f</math>, %)</b>		
<b>Necking Ratio (<math>R_A</math>, %)</b>		

**Calculations:**



**Figure 1.** Stress-Strain curve of the reinforcing steel bar specimen

**Table 1.** Evaluation of the tension test results considering TS 708 (March 2016)

Description of the Steel Sample and Corresponding Limit Values		Test Results and Evaluation	
Class / Type	S420 / Ribbed	<i>Test Results</i>	<i>Discussion</i>
Yield Strength $\geq 420$ (MPa)		$\sigma_{\text{yield}} = \dots\dots\dots$ MPa	<input type="checkbox"/>
Tensile Strength $\geq 500$ (MPa)		$\sigma_{\text{tensile}} = \dots\dots\dots$ MPa	<input type="checkbox"/>
$1.15 \leq \frac{\text{Tensile Strength}}{\text{Yield Strength}} < 1.35^*$		$\sigma_{\text{tensile}} / \sigma_{\text{yield}} = \dots\dots\dots$	<input type="checkbox"/>
$\frac{\text{Experimental Yield Strength}}{\text{Characteristic Yield Strength}} \leq 1.30$		$\sigma_{y,\text{experimental}} / \sigma_{y,\text{characteristic}} = \dots\dots\dots$	<input type="checkbox"/>
		Ductility = % $\dots\dots\dots$	<input type="checkbox"/>
		<b>Conclusion</b>	
Ductility $\geq \%10$		The tested S420 class steel sample: <b><i>conforms / does not conform</i></b> to the limit values specified in the relevant standard and regulation.	

\* The upper limit value given as 1.35 in Turkish Seismic Code (2018) is a requirement for the S420 steels to be used in RC buildings that resist to seismic loads.

**2.1. BENDING TEST**

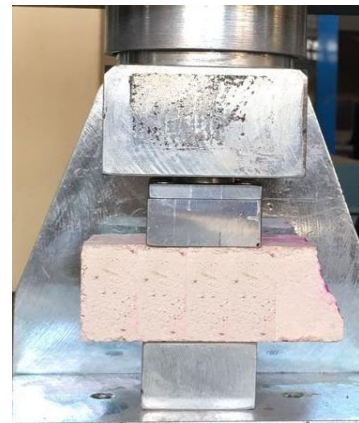
Specimen	Hardened Cement Mortar
Distance Between Supports (l, mm)	
Width (b, mm)	
Height (h, mm)	
Failure Load (kN)	
Flexural Strength (MPa)	



**Calculation:**

**2.2. COMPRESSION TEST**

Specimen	Hardened Cement Mortar
Area (mm <sup>2</sup> )	
Failure Load (kN)	
Compressive Strength (MPa)	



**Calculation:**