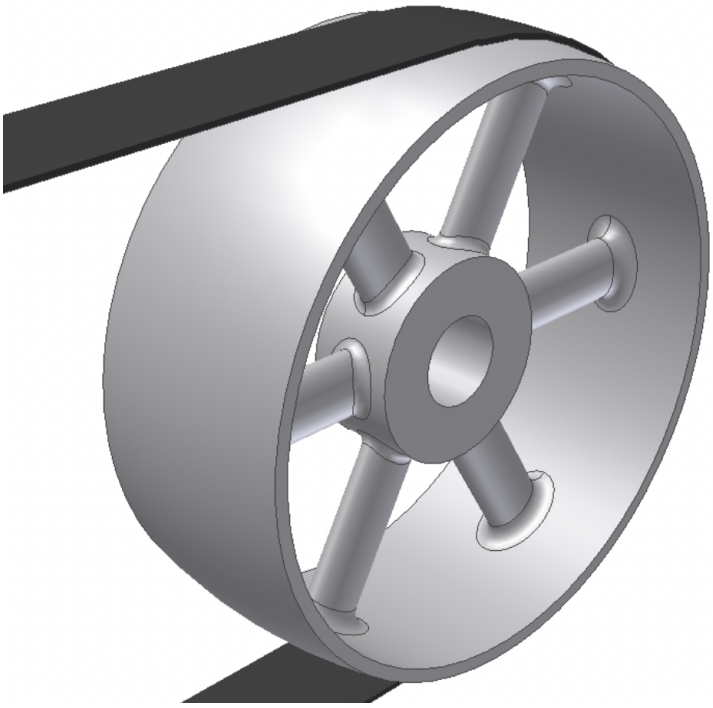
AE227 PROJECT REPORT

Rotor Shaft Belt System

ANSYS



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GROUP D

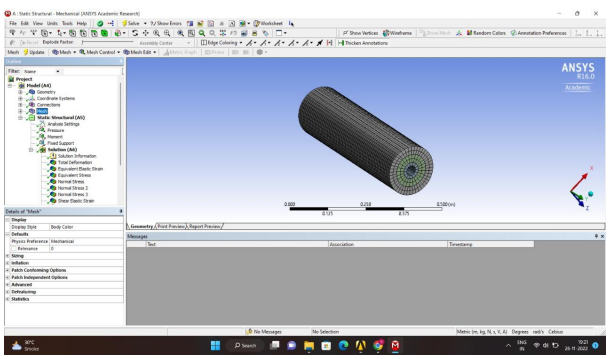
ROTOR SHAFT & Its COMPOSITION

Rotor shaft is a cylindrical object which plays a vital role in the rotor shaft belt system. It is composed of three materials steel as outer layer, brass as middle layer and aluminum as inner core. The term shaft usually refers to a component of circular cross section that **rotates and transmits power from a driving device, such as a motor or engine, through a machine**. Shafts can carry gears, pulleys and sprockets to transmit rotary motion and power via mating gears, belts and chains. I have performed the analysis of the shaft under pressure due to belt and shear force due to belt.

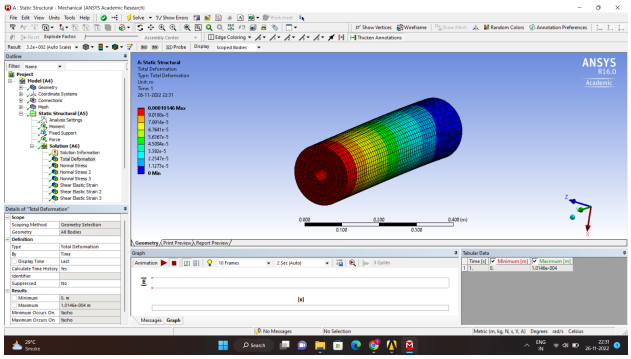
PROPERTIES OF SHAFT

MATERIAL	DENSITY(Kg/m3)	YOUNG'S MODULUS(Pa)	POISSON'S RATIO
STEEL	7850	2x10^11	0.28
BRASS	8730	7x10^10	0.31
ALUMINIUM	2700	7x10^10	0.33

DEFORMED AND UNDEFORMED SHAFT



UNDEFORMED

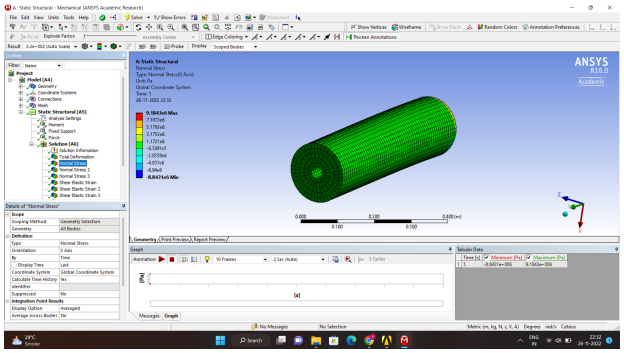


DEFORMED

PLOTS OF COMPONENTS OF STRESS AND STRAIN

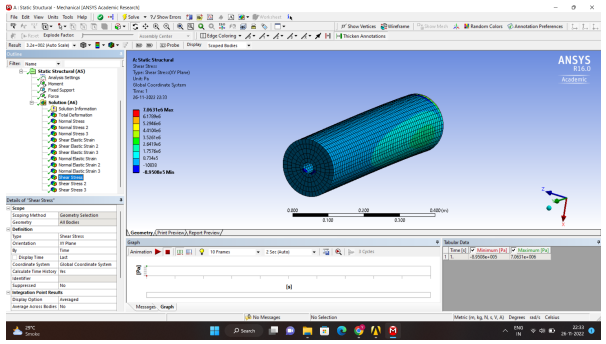
SIX COMPONENTS OF STRESS

NORMAL COMPONENTS

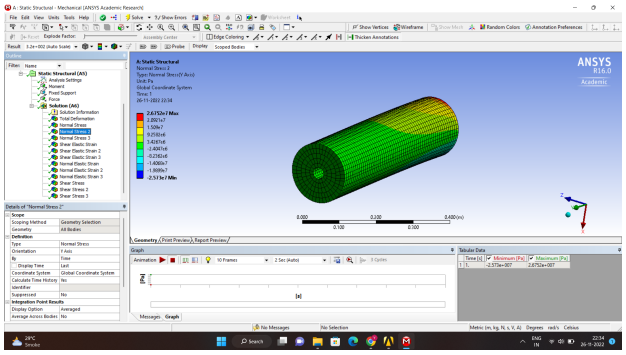


Stress along x-axis

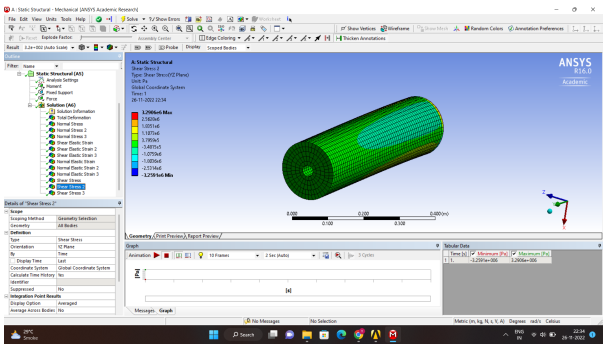
SHEAR COMPONENTS



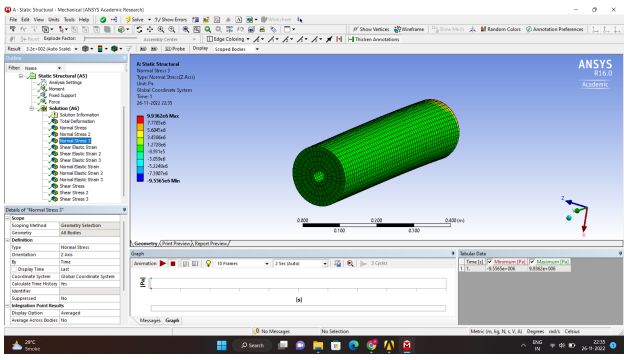
Stress along xy-plane



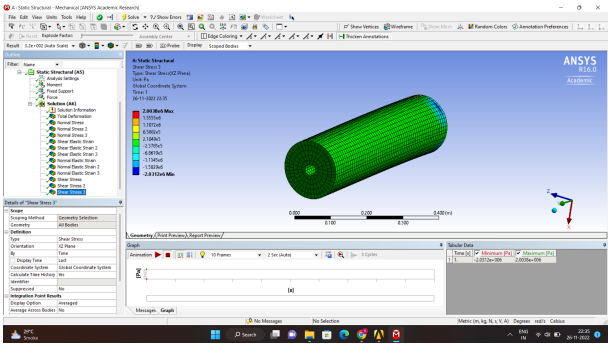
Stress along y-axis



Stress along yz-axis



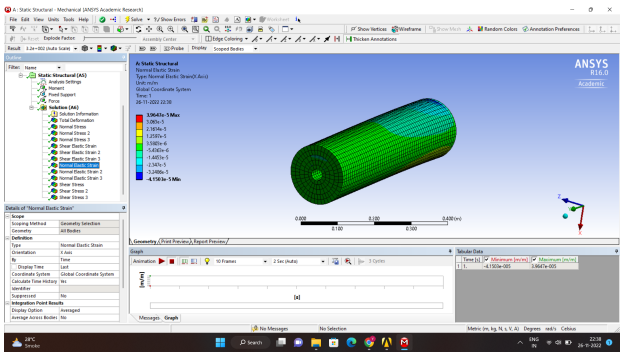
Stress along z-axis



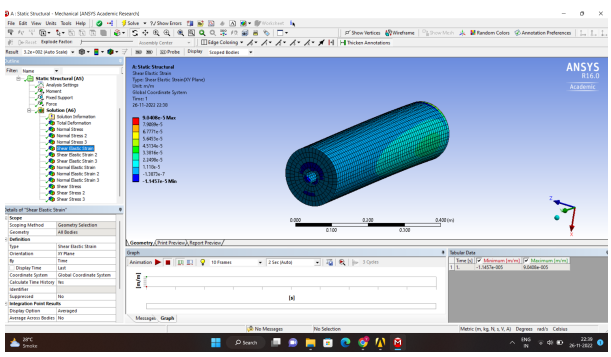
Stress along xz-plane

SIX COMPONENTS OF STRESS

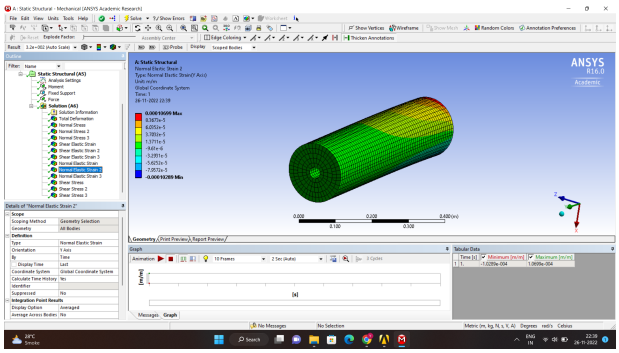
NORMAL COMPONENTS



Strain along x-axis



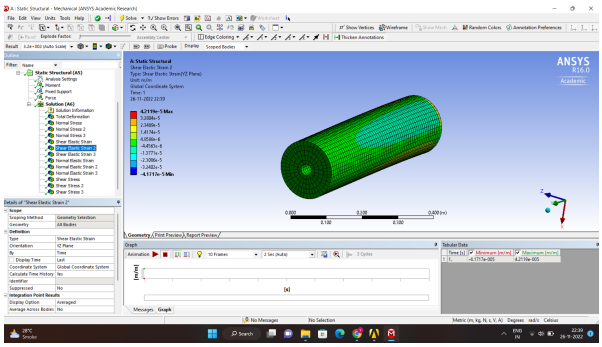
Strain along y-axis



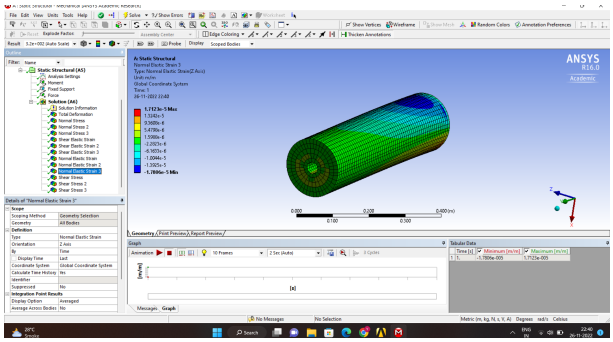
Strain along z-axis

SHEAR COMPONENTS

Strain along xy-plane



Strain along yz-axis



Strain along xz-axis

ANALYSIS

OPTIMIZE THE USE OF MATERIAL

After the analysis of the shaft under pressure and shear force due to the belt we get an idea about how fatigue is the material we are using. By observing the location of maximum stress and strain we get to change the material accordingly. This is one of the important results we get from the operation performed in ansys.

SAFETY FACTOR

If we assume our breakdown strength of the material to be some value , then we can change either the design of the shaft or the load on it such that the safety factor doesn't exceed a certain value which is dependent on the work the shaft has to perform.

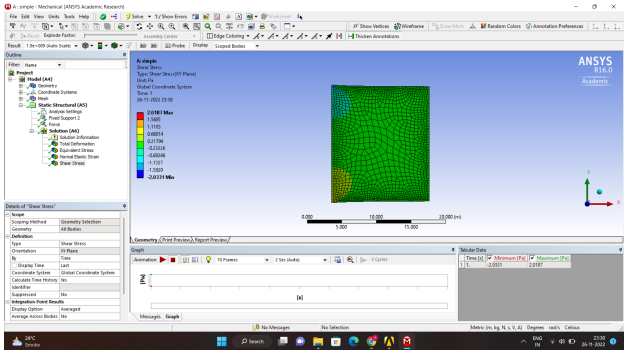
DESIGN POINT OF VIEW

The analysis gives us the location where the material is experiencing maximum load, hence we can change the design at those points such that the stress or strain would spread across the surface instead of focusing on some single point

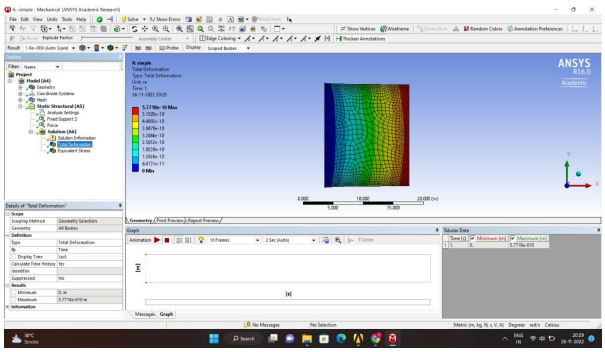
ASSIGNMENT

SIMPLE STRESS

SHEER STRESS IN XY



TOTAL DEFORMATION



The Stress and strain in y- axis axis is nearly equal to zero as the net force is applied in x direction

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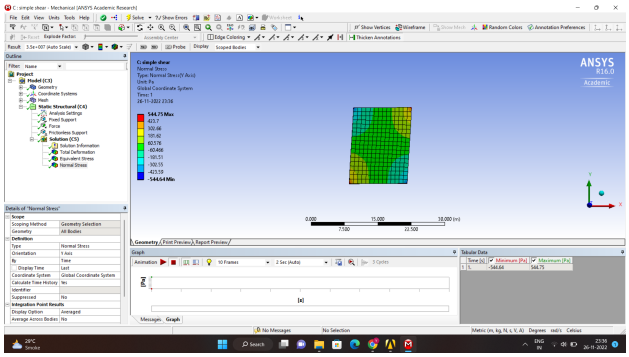
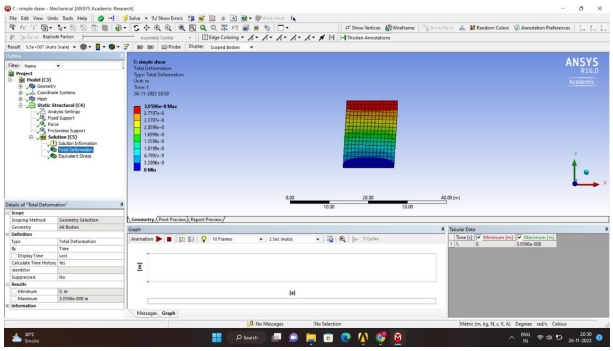
SIMPLE SHEAR

STRESS IN Y AXIS



TOTAL DEFORMATION

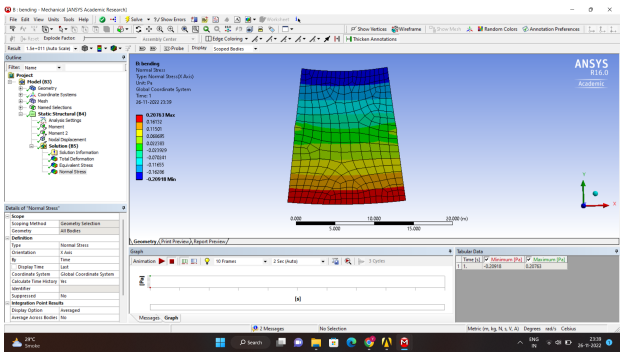


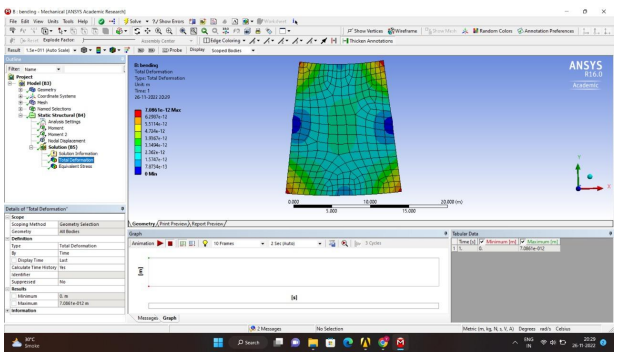
In simple shear, the stress components in y direction is nearly equal to zero

BENDING

STRESS IN X

TOTAL DEFORMATION





Here normal stress in y and and shear in xy are approx. 0 as only normal in x gives moment distribution. Maximum Stress at the outer edge of the beam

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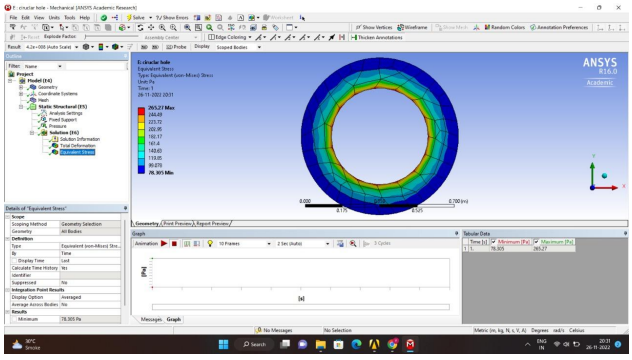
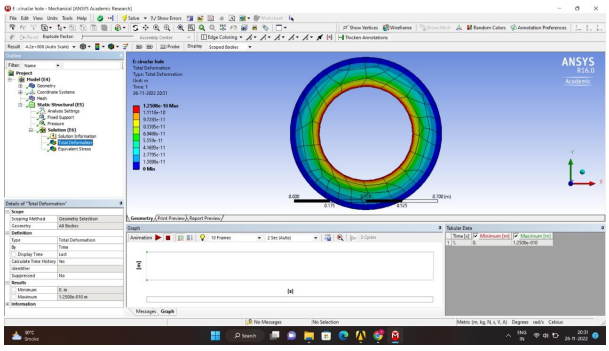
CIRCULAR HOLE

EQUIVALENT STRESS

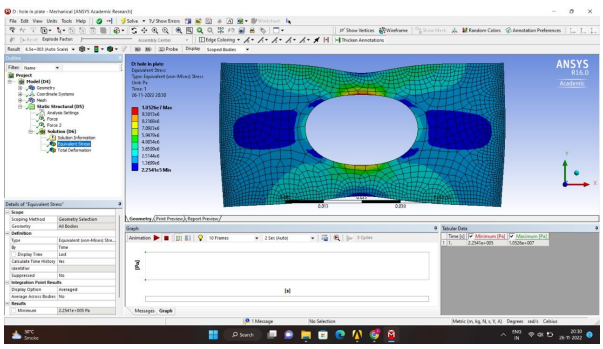
TOTAL DEFORMATION



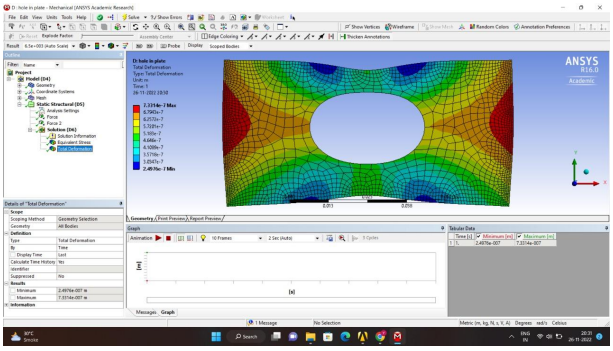


HOLE IN RECTANGULAR PLATE

EQUIVALENT STRESS

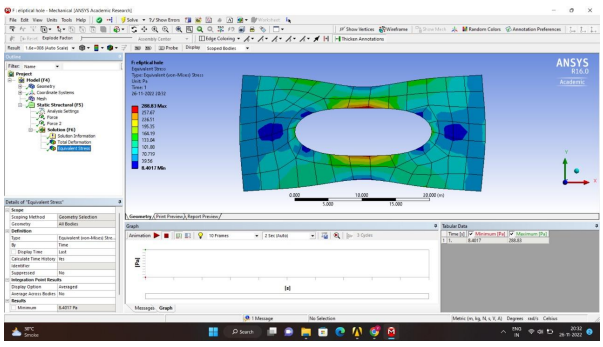


TOTAL DEFORMATION

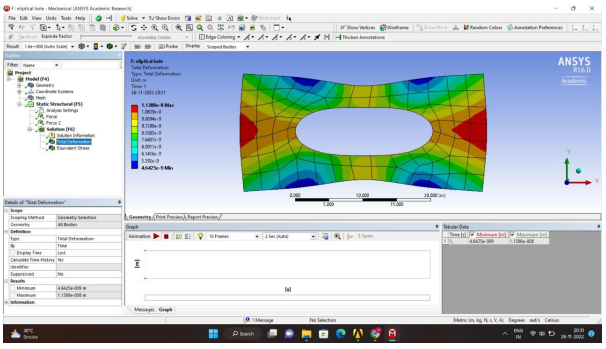


ELLIPTICAL HOLE IN RECTANGULAR HOLE

EQUIVALENT STRESS



TOTAL DEFORMATION



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