NAME:

PLEASE SHOW WORK.

MACHINE ANALYSIS
MCE 362 S'16
EXAM 1

1) TEST DATA FROM A NEW HYDRAULIC FITTING DESIGN SHOWS A MEAN BURST VALUE OF 189.7 N/mm^2 AND A STANDARD DEVIATION OF 8.3 N/mm^2. 8 pts

4% OF THE FITTINGS WILL HAVE A BURST VALUE BELOW ?? N/mm^2 THE TEST DATA HAS A NORMAL DISTRIBUTION.

2) A TENSILE TEST OF A METAL SAMPLE SHOWS THE FOLLOWING DATA. THE METAL SAMPLE PIECE HAS AN INITIAL CROSS-SECTION AREA OF 0.2 IN^2 AND A GAGE LENGTH OF 2 IN 12 pts

FORCE (LB)	ELONGATION (IN)	
1200	0.001154	ELASTIC
2400	0.002308	ELASTIC
4800	0.004616	ELASTIC
5900	0.0198	
6500	0.216	
6800	0.358	
6000	0.682 (FRACTURE)	

DETERMINE THE FOLLOWING:

a) MODULUS OF ELASTICITY, E

b) MATERIAL: STAINLESS STEEL, COPPER, ALUMINUM

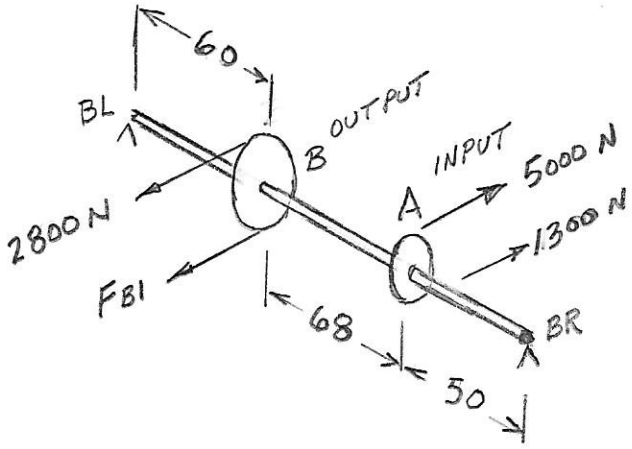
c) ULTIMATE STRENGTH (ENGINEERING)

d) ELONGATION % AT FRACTURE

A SKETCH/PLOT OF DATA IS NOT REQUIRED, BUT IT COULD BE HELPFUL

3)

42 pts



ALL DIMENSIONS ARE MM

SHAFT DIAM = 18

SPROCKET A DIAM = 35

SPROCKET B DIAM = 56

DETERMINE THE FOLLOWING FOR THIS SHAFT ASSEMBLY:

a) INPUT TORQUE TO SHAFT AND FORCE FBI

b) REACTIONS AT BEARINGS BL AND BR

c) SHEAR AND MOMENT EQUATIONS AND/OR DIAGRAMS FOR THE SHAFT.

d) BENDING AND TORSIONAL STRESS AT LOCATION OF MAXIMUM BENDING MOMENT

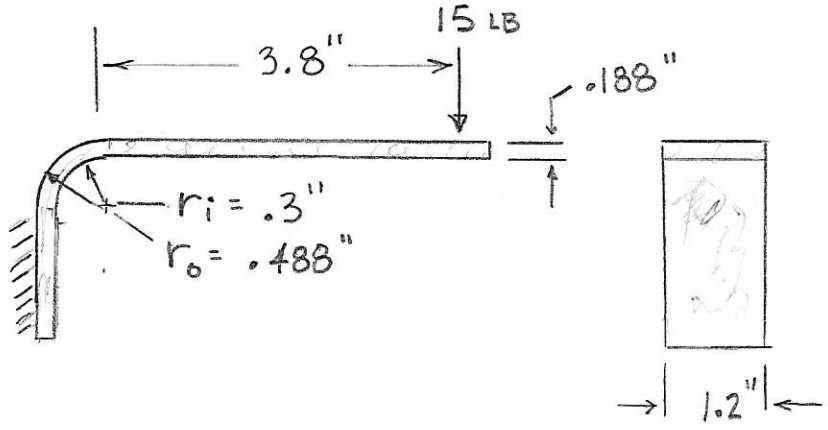
e) PRINCIPAL STRESSES AT LOCATION FROM d)

f) EXPRESS V, SHEAR, IN A SINGULARITY FUNCTION

g) MAXIMUM TRANSVERSE SHEAR STRESS

4) 18 pts YOU ARE DESIGNING A STEM THAT WILL TRANSMIT TORQUE (ONLY) AND YOU DETERMINE THAT THE MATERIAL MUST HAVE A MINIMUM DIAMETER OF 10 MM TO MEET THE ALLOWABLE STRESS. YOUR PROJECT MANAGER ASKS YOU TO CONSIDER SOME AVAILABLE 9.7 MM MATERIAL, TO AVOID DELAY. SHOW HOW YOU WOULD PROVE TO THE PROJECT MANAGER THAT THIS IS A BAD IDEA.

5) a) 25 pts

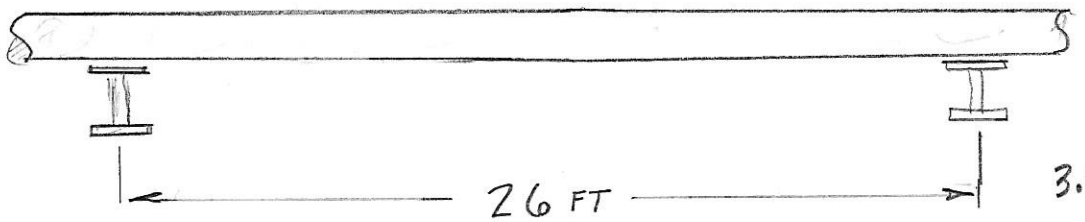


DO ONE OF THE FOLLOWING TWO PROBLEMS, 5 a) AND 5 b) DO BOTH AND YOU WILL EARN THE HIGHER SCORE OF THE TWO.

CALCULATE THE MAXIMUM STRESS IN THE STRAIGHT REGION OF THIS BRACKET, AND IN THE CURVED REGION.

5b)

25 pts



3" XXS PIPE:
3.5" OUTER DIAM.
2.27" INNER DIAM.

THIS 3" PIPE HAS AN INTERNAL PRESSURE OF 3000 $^{lb}/_{in^2}$ AND IS SUPPORTED AS SHOWN. THE WEIGHT OF THE PIPE IS 1.6 $^{LB}/_{IN}$ (1.6 LB PER INCH OF LENGTH)

DETERMINE THE MAXIMUM PRINCIPAL STRESSES AT THE OD AND ID OF THE PIPE