IQRA NATIONAL UNIVERSITY, PESHAWAR

DEPARTMENT OF CIVIL ENGINEERING

Final Term Examination (Summer Semester 2020)

Subject: Advanced Mechanics of Materials (Master of Science in Civil Engineering)

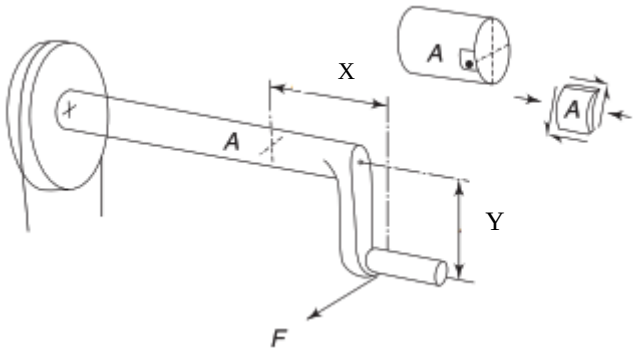
Instructor: Engr. Fawad Ahmad **Total Marks:** 80

Note: R is your University ID. If any one found copying other will get zero.

Q.NO (01) (15)

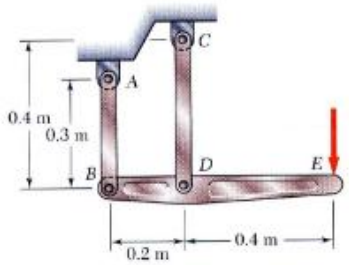
A force F = **R** N is necessary to rotate the shaft shown in Figure below at uniform speed. The crank shaft is made of ductile steel whose elastic limit is 207,000 kPa, both in tension and compression. With E = 223×10^6 kPa, n = 0.**First two Digits of R**, determine the diameter of the shaft, using the octahedral shear stress theory and the maximum shear stress theory. Use a factor of safety N = **First Digit of R**. Consider a point on the periphery at section A for analysis.

Dimensions X= **First two Digits of R**+5 (cm) Y= **First two Digits of R**



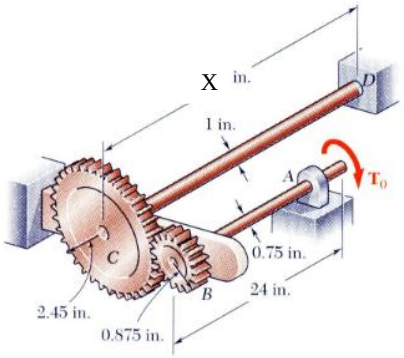
Q.NO(02) (15)

The rigid bar BDE is supported by two links AB and CD. Link AB is made of aluminum (E = 70 GPa) and has a cross-sectional area of 5mm. Link CD is made of steel (E = 200 GPa) and has a cross-sectional area of (60mm2). For the **First two Digits of R** -kN force , determine the deflection a) of B, b) of D, and c) of E.



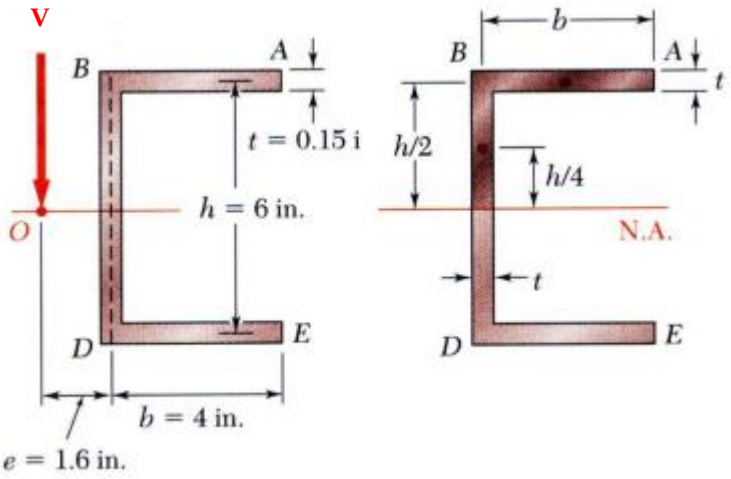
Q.NO (03) (15)

Two solid steel shafts are connected by gears. Knowing that for each shaft G = **First two Digits of R** x 10^6 psi and that the allowable shearing stress is 10 ksi, determine (a) the largest torque T_0 that may be applied to the end of shaft AB, (b) the corresponding angle through which end A of shaft AB rotates. Dimensions X= **First two Digits of R** + 10



Q.NO (04) (15)

Determine the location for the shear center of the channel section with b = 4 in, h = 6 in., and t = 0.15 in. Determine the shear stress distribution for V = **First two Digits of R + 3** kips.



Q.NO (05) (20)

The overhanging beam supports a uniformly distributed load and a concentrated load. Knowing that for the grade of steel to used δall = **First two Digits of R + 4** ksi and 𝒯all = **First two Digits of R + 1** ksi, select the wideflange beam which should be used.

1. Determine reactions at A and D.
2. Determine maximum shear and bending moment from shear and bending moment diagrams.
3. Calculate required section modulus and select appropriate beam section.
4. Find maximum normal stress.
5. Find maximum shearing stress.

First two Digits of R (kips)