國立高雄應用科技大學
100 學年度碩士班招生考試
機械與精密工程研究所（甲組）

准考證號碼□□□□□□□□□□ （考生必須填寫）

材料力學

注意：a. 本試題共 5 題，每題 20 分，共 100 分。
b. 作答時不必抄題。
c. 考生作答前請詳閱答案卷之考生注意事項。

1. The connection shown in the figure 1, consists of five metal plates, (plates on left side, each 5 mm thick, and plates on right side, each 8 mm thick) jointed by three 10 mm diameter bolts. The total load transferred between plates is 10 kN, distributed among the plates as shown.
   (a) Calculate the largest shear stress in the single bolt, disregarding friction between the plates. (10%)
   (b) Calculate the largest bearing stress acting against the single bolt. (10%)

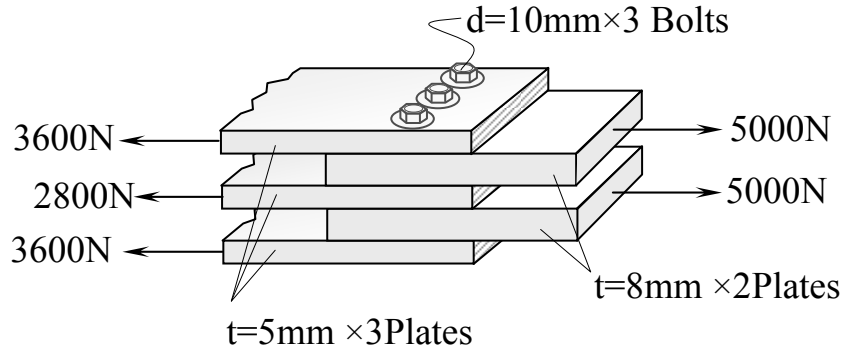

Figure. 1

2. A steel block with the original length L=200mm , height b=40mm and width a=60mm , subjected to an axial compression load P=400kN shown in the figure 2. After the P loading, if dimensions b and L are change to 40.02mm and 199.7 mm, respectively, calculate:
(a). Poisson's ratio.(5%) (b). The modulus of elasticity. (5%) (c). The final value of width a. (5%) (d).The modulus of shear elasticity. (5%)

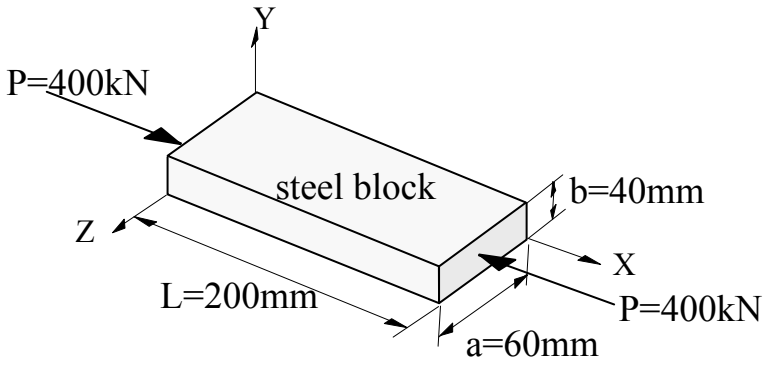

Figure. 2

3. Motor delivers 275hp at 1000rpm to the end of a shaft (see figure 3). The gear B and gear C take out 125hp respectively.
(Assume G=11.5×10^{6}psi for the material of the shaft)
(a) Determine the required diameter d of the shaft if the allowable shear stress is 7500psi. (10%)
(b) Determine the required diameter d if the allowable twist angle is limited under 1.5°. (10%)

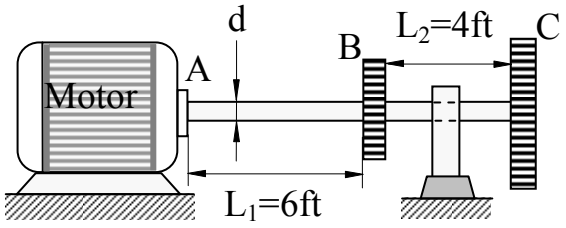

Figure. 3

4. The simple supported beam and triangular distributed load as figure 4 shown. Please use the method of singularity function to determine (a) The deflection of point C (y_C=?) (10%) (b) The angular of A(θ_A=?) (10%) (The modulus of elasticity is E)

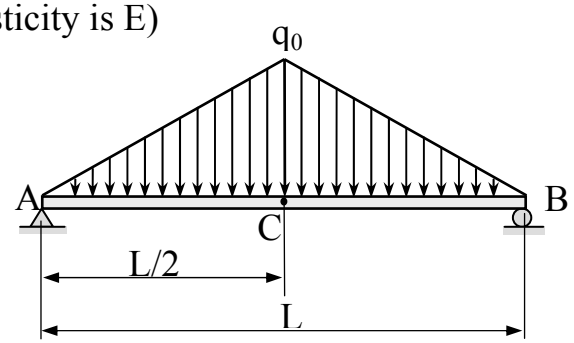

Figure 4

5. In figure 5.1, a steel bar is made by steel with S_y=220Mpa, wrench applied self-weight 10kg and a horizontal force F=300N, an axial loading P=500N was acted also. Determine (a) the σ_x and τ_{xy} of the element D on the surface of the circular bar which has the maximum stress as figure.5.3 shown. (5%) (b) The location of θ for the element D as figure.5.2 shown. (5%) (c) The safety factor n=? for the maximum shear stress theory. (5%) (d) The safety factor n=? for the distortion theory. (5%)

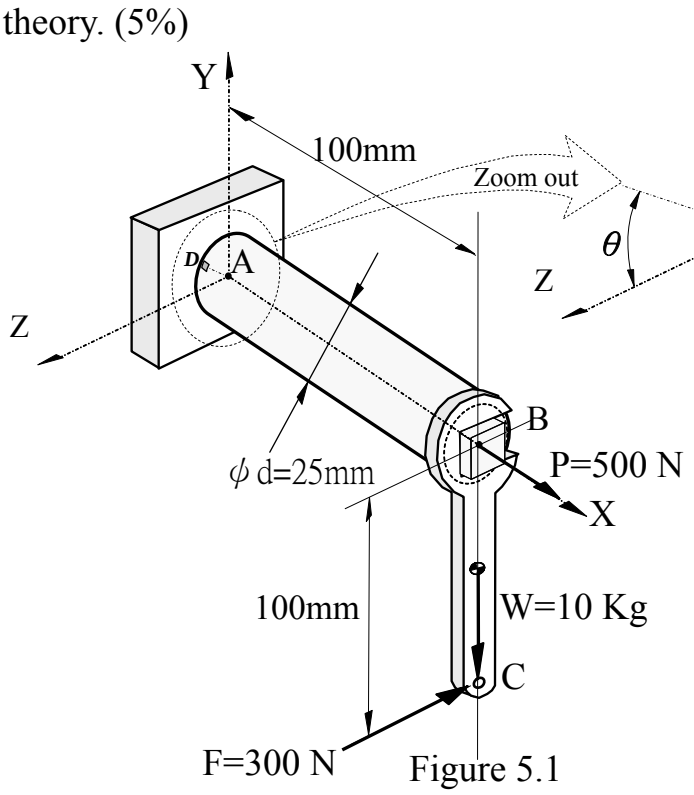

Figure 5.1

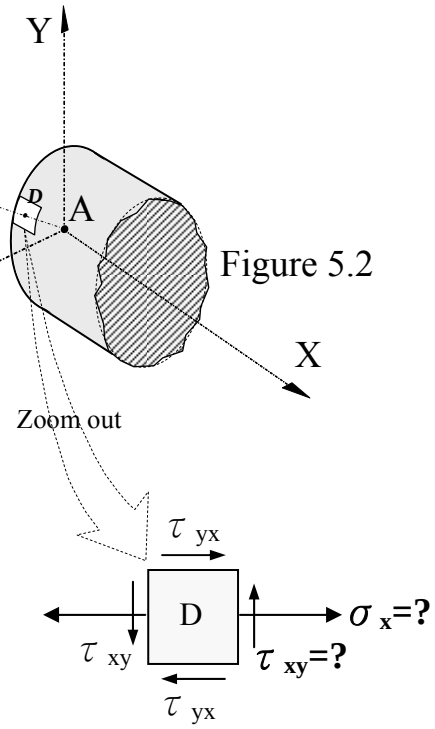

Figure 5.2

Figure 5.3

Figure 5