

※ 考生請注意：本試題可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

一、專業英文：Answer the following questions (10%)

1. The mass unit "Slug" in English system is defined as:
2. The force unit "Newton" in SI system is defined as:
3. The work or energy unit "Joule" in SI system is defined as:
4. The for power unit "Watt" in SI system is defined as:
5. The pressure unit "Pascal" in SI system is defined as:

二、專業英文：Translate the following sentence into Chinese: (15%)

Mechanics is a branch of the physical sciences that is concerned with the state of rest or motion of bodies that are subjected to the action of forces. In general, this subject can be subdivided into three branches: rigid-body mechanics, deformable-body mechanics, and fluid mechanics.

三、Figure 1 shows a planetary gear train with 3 planets; Where  $R$  is the ring gear,  $A$  is the arm,  $P$  is the planet, and  $S$  is the sun. Let  $S$  fixed,  $R$  is the input, and  $A$  is the output. Find its train value in terms of the number of tooth of  $S$  and  $R$ . (13%)

四、Determine the magnitude of the moment of force  $F$  about segment  $OA$  of the pipe assembly in Figure 2: (12%)

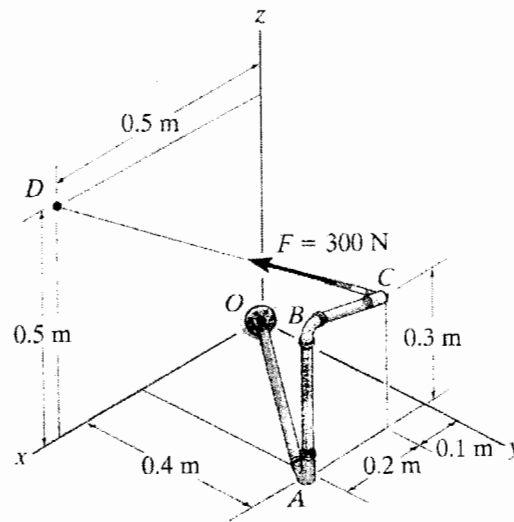
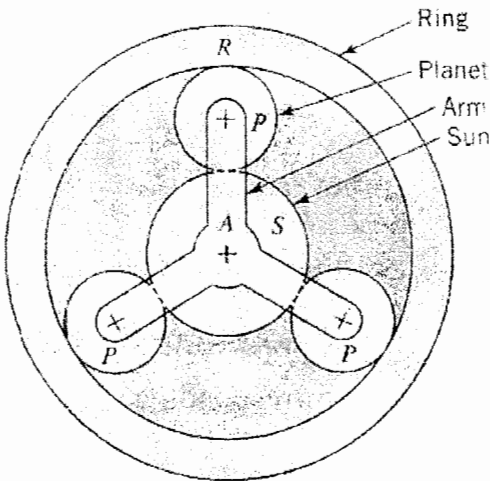
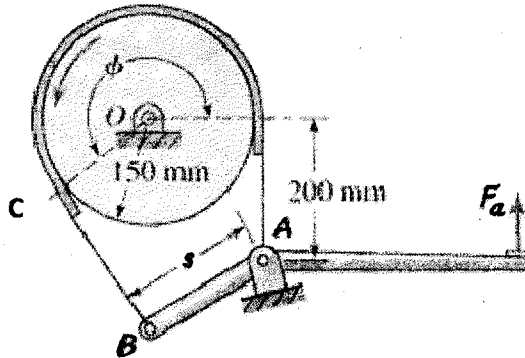


Figure 1: Planetary gear train (problem 3)

Figure 2: pipe moment (problem 4)

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- 五、(25%) The differential brake depicted in the figure is to stop a couple 450 N-m at 220 rpm. The maximum tension in the belt is 7200 N. The coefficient of friction between the lining and the drum is 0.14. Determine (a) the angle of wrap, (b) the length of arm  $s$  from the geometry of the brake where  $CB \perp AB$ , and (c) the actuating force  $F_a$



- 六、(25%) A countershaft has helical gear (B), bevel gear (D), and two supporting bearings (A and C) as shown in figure. Loads acting on the bevel gear are known. Forces on the helical gears can be determined. Shaft dimensions are known. All shoulder fillets have a radius of 5 mm. Only bearing (A) takes thrust. (a) Find the reaction forces at A and C (b) Draw load, shear force and bending moment diagrams for the shaft in the  $xy$  and  $xz$  plane. Also draw the torque diagram along the shaft. (c) Find where the maximum moment occurs at the shaft and its value.

