

# 淡江大學九十三年年度轉學生招生考試試題 49-1

系別：機械與機電工程學系三年級

科目：工程力學(含靜力學、動力學、材料力學)

准帶項目請打「○」否則打「×」	
○	簡單型計算機

節次： 7 月 14 日 第 3 節

本試題共 1 頁

1. (30%) The low-bed trailer (拖車) shown is designed so that the rear end of the bed can be lowered to ground level in order to facilitate the loading of wrecked vehicles (使易於放下廢車). A 1500 kg vehicle has been hauled (拖運) to the position shown by a winch (絞車); the trailer is then returned to a traveling position where  $\alpha = 0$  and both  $AB$  and  $BE$  are horizontal. Considering the weight of the disabled automobile (廢車), determine the force which must be exerted by the hydraulic cylinder of  $CD$  to maintain a position with  $\alpha = 0$ .

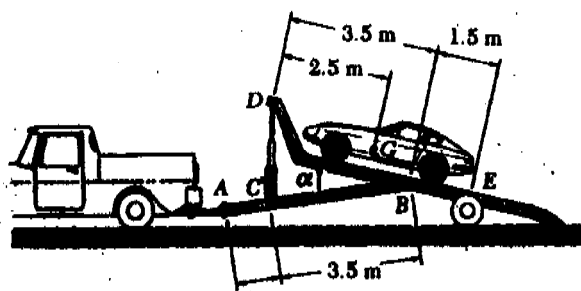


Fig. Problem 1

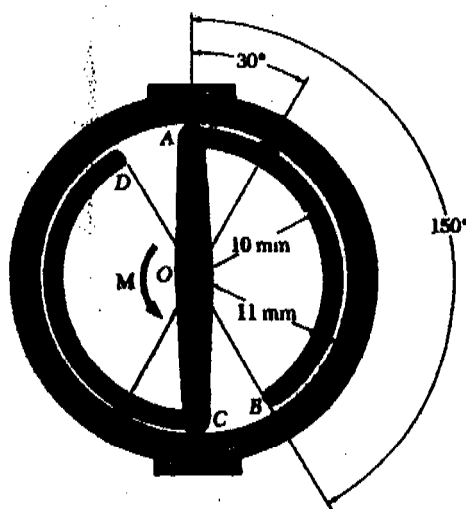


Fig. 2 Problem 2

2. (35%) A centrifugal clutch (離心式離合器) shown has a constant angular velocity of 3000 rpm. Thin curved members  $AB$  and  $CD$  are connected by pins at  $A$  and  $C$  to the arm  $AC$  which rotates about a fixed point  $O$ . Each of the members  $AB$  and  $CD$  has a mass of 5 g and a radius of 10 inch. As the clutch rotates counterclockwise, two knobs located  $30^\circ$  slide on the inside of a fixed cylindrical surface of radius 11 mm with the coefficient of kinetic friction is 0.35. Determine the couple  $M$  which must be applied to arm  $AC$ . Hint: The distance from the centroid (質量中心) of curved members  $AB$  (or  $CD$ ) to the fixed point  $O$  is 7.379 mm.

3. (35%) The axle (軸) of an automobile subjected to the normal forces and a torque producing the state of stress shown in Fig. (a) Determine the principal stresses and show a sketch of the element oriented with principal stresses acting on it. (b) Determine the maximum stresses and show them on a sketch of a properly oriented element.

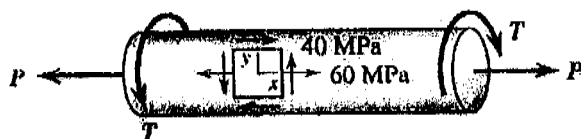


Fig. Problem 3

Hint:  $\sigma_x' = \sigma_1 = \frac{\sigma_x + \sigma_y}{2} + \sqrt{\left(\frac{\sigma_x - \sigma_y}{2}\right)^2 + (\tau_{xy})^2}$       $\tan 2\theta_p = \frac{2\tau_{xy}}{\sigma_x - \sigma_y}$       $\tan 2\theta_s = -\frac{\sigma_x - \sigma_y}{2\tau_{xy}}$