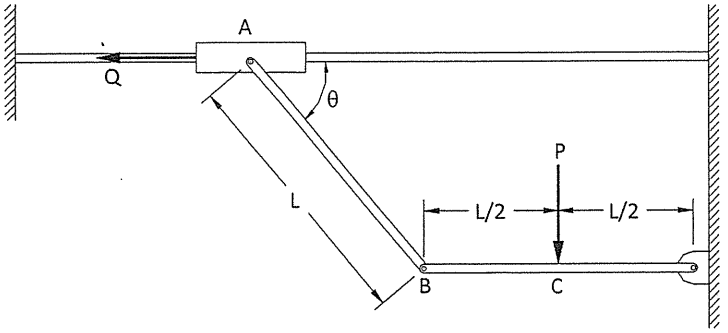
國立成功大學 108 學年度碩士班招生考試試題

系　　所：機械工程學系

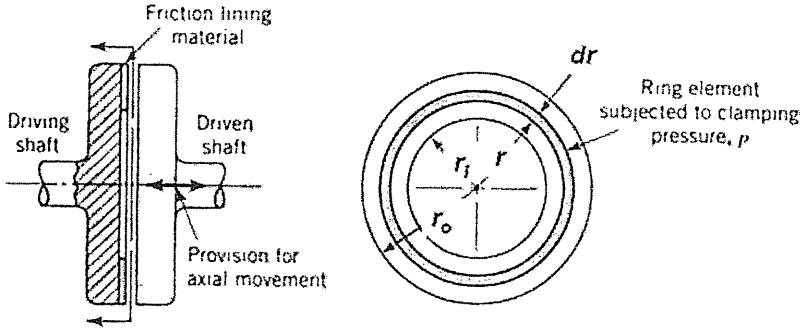
考試科目：靜力學及專業英文　　考試日期：0223，節次：1

※ 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。

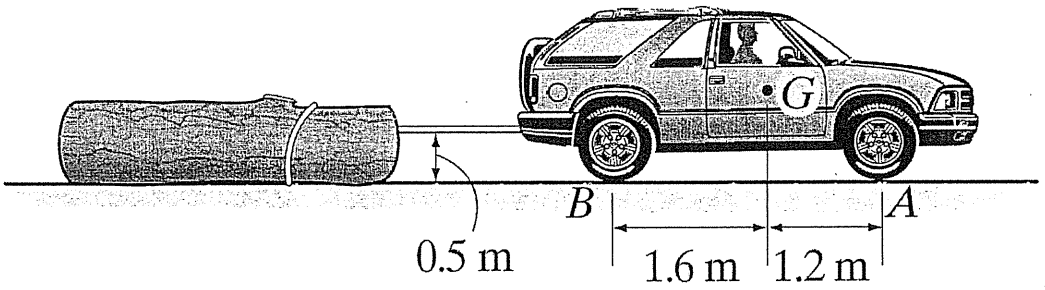
1. Link AB is connected to collar A, which can slide with negligible friction on horizontal rod EF. The mass of linkages is negligible. (a) Determine the value of force Q necessary to maintain equilibrium by using principle of virtual work. (8%) (b) Computer the value of Q when θ= 60°, L = 400 mm, and P = 200 N. (5%)



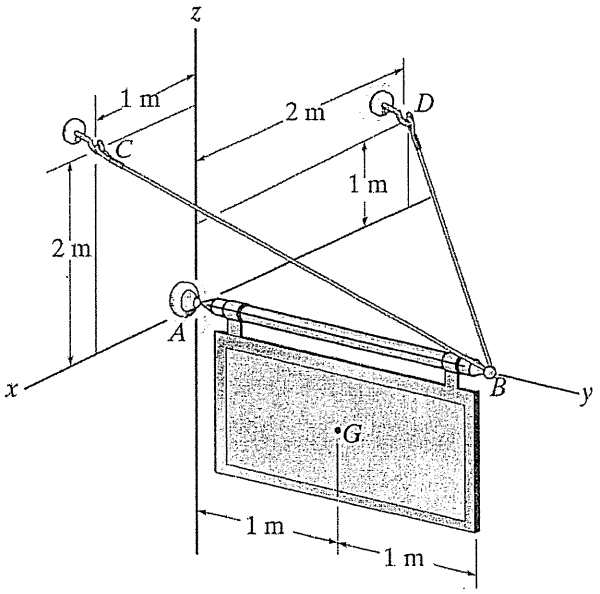
2. Two assumptions, which may occur at the interface of the disk cultch as shown, are uniform pressure and uniform wear. (a) Under assumption of uniform pressure, the pressure are the same through lining interface. Determine the torque capacity under this assumption is $T_p = \frac{2Ff(r_o^3 - r_i^3)}{3(r_o^2 - r_i^2)}$. (4%)(b) Under assumption of uniform wear, the product of interface pressure and disk radius are constant. Again, Determine the torque capacity under this assumption is $T_w = \frac{Ff(r_o + r_i)}{2}$. (4%)(c) Prove the assumption of uniform wear gives a lower calculated clutch torque capacity than the assumption of uniform pressure. In other word, $T_w < T_p$ (4%) (f: coefficient of friction; r_o: outer radius of lining; r_i: inner radius of lining; F: axial force clamping the driving and driven disks; dF = pdA : normal force acting on a differential ring element of radius r; p: interface clamping pressure)



3. As shown in figure, a 5-Mg front-wheel-drive truck (SUV) has a center of mass at *G*. The coefficient of static friction between the log and the ground is $\mu_s = 0.7$, and the coefficient of static friction between the front wheels of the truck and the ground is $\mu_s' = 0.4$. The rear wheels are free to roll. Assume that the engine of the truck is powerful enough to generate a torque that will cause the front wheels to slip. (a) Draw free-body diagrams of the truck and the log, respectively. (10%) (b) Determine the maximum mass of the log that can be towed by the truck. (15%)



4. As shown in Figure, the sign has a mass of 120 kg with center of mass at *G*. (a) Explain the function of the ball-and-socket joint *A* and how many unknown force components there are. (5%) (b) Determine the tension in wires *BC* and *BD*. (10%) (c) Determine the reactions at the ball-and-socket joint *A*. (10%) (The solutions must include free-body diagrams.)



5, 專業英文

(a) 中翻英 (13%) (文中第一次出現的 ABS 及 CBS 不能用縮寫)

根據國外的調查資料，加裝防鎖死煞車系統（ABS）或前後連動煞車系統（CBS）對於機車騎士安全有明顯效果。ABS(防鎖死煞車系統)目的是預防車輪鎖死打滑，當機車急煞時，ABS 會利用車輪角速度信號，判斷輪速與車速差異，來控制煞車力道，防止輪胎鎖死摔車。CBS(前後連動煞車系統)可有效將機車的前後輪同時減速，維持機身穩定，當騎士煞車時，只要左或右任一邊煞車，就能同時煞住前後輪，降低單輪煞車造成打滑或造成翻車。

(b) 英翻中 (12%)

In some circumstances, electric vehicles (EVs) are far less harmful for the environment than traditional internal combustion engine vehicles (ICEVs). Nonetheless, some scientists are questioning their green credentials. Concerns are focused on two areas: How electric vehicles (EVs), and particularly their batteries, are manufactured. How the electricity which powers them is generated. Therefore, there is no such thing as a zero-emission vehicle.