

MECHANICS

- (1) As shown in Fig.1, a block is sliding with speed V along the slanted rod which is fixed rigidly to another vertical rod. The angle between both rigid rods is θ , which is of course constant. This two-rod structure is spinning with angular speed Ω about the vertical rod. The block distances p from the vertical rod as shown in the figure. For convenience of analysis, let a rotating frame $oxyz$ be attached to the structure so that the two rods lie in the $x-z$ plane. Also, there is a fixed frame $OXYZ$ of which the Z -axis coincides with the z -axis. At the time of consideration, the x -axis intersects an angle ψ with the X -axis. Determine the absolute velocity and absolute acceleration in the components of the fixed coordinate system. (20%)

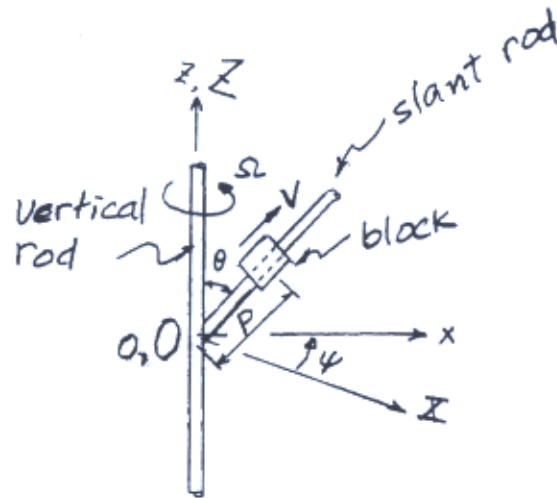


Figure 1: Schematic diagram for Problem 1.

- (2) A uniform rod with length L and mass m in the $X-Z$ plane is acted by a force F and its weight mg as shown in Fig.2. The acting point of the force distances a from the lower left end of the rod and always make angle θ (which is therefore constant) with the axis of rod which intersect with the local horizon an angle, ψ . The OXZ is a fixed frame and in the vertical plane.
- (a) Determine the acceleration at the center of mass and the angular acceleration of the rod. (10%)
- (b) If the rod is static at the instant of consideration, say, at time $t = 0$, determine its velocity at the center of mass and the angular velocity of the rod at time t . (10%)

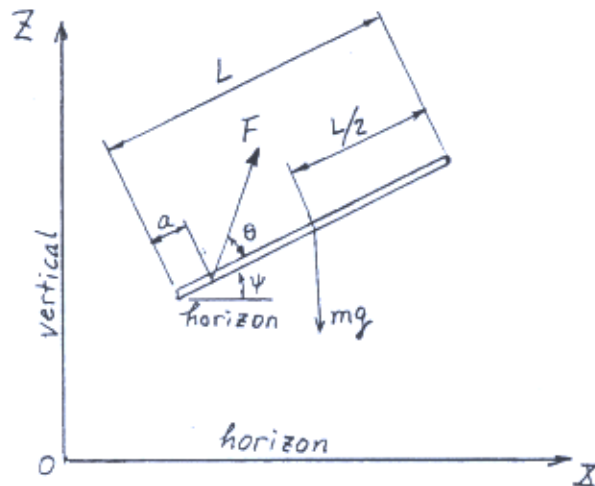
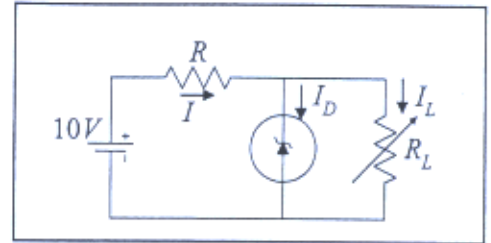


Figure 2: Schematic diagram for Problem 2.

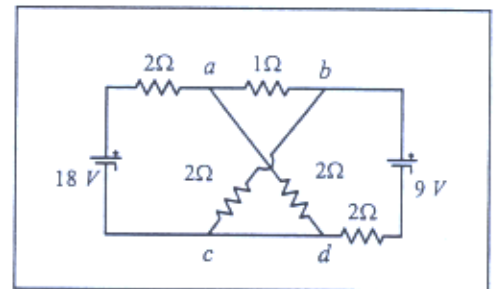
(背面仍有題目,請繼續作答)

ELECTRONICS

- (3) 右圖的曾納二極體，其崩潰電壓為 $V_Z = 5V$ 。另外，可變電阻 R_L 的大小為 $5\Omega \leq R_L \leq 100\Omega$ ，若要保持 R_L 兩端電壓為 V_Z ，求 R 的範圍為何？(10%) 另外，二極體的額定功率必須為多少？(10%)



- (4) 請將右圖畫為平面電路(10%)「請在你所劃的平面電路上面標示 a、b、c、d 等位置」。另外，右圖有幾個獨立節點？(5%)，又有幾個獨立網目？(5%)



- (5) 求右圖電路對 A、B 兩端點之戴維寧等效電路(10%) 以及諾頓等效電路(10%)

