Note: If necessary, please provide any parameters to solve the following problems.

1. (a) State and derive the equation represents the principal of work and energy for a particle. (15%)

   (b) State the conservation of energy for a particle and derive the equation from (a). (10%)

2. The disk, having a weight of 75 lb, is pinned at its center O and supports the block A that has a weight of 15 lb. If the belt which passes over the disk is not allowed to slip at its contacting surface, determine the natural period of vibration of the system using the energy method.
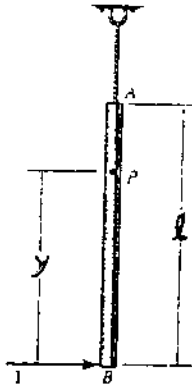
   (25%)
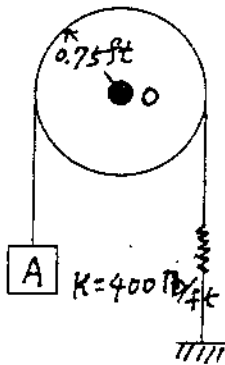
Problem 2.
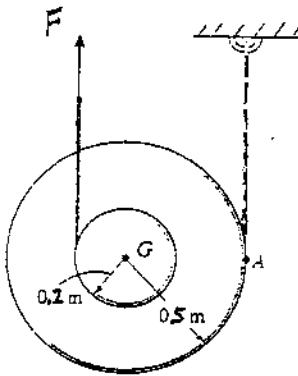
Problem 3.

3. The spool shown has a mass of 10 kg and a radius of gyration of R = 0.4 m. If the cords of negligible mass are wrapped around its inner hub and outer rim as shown, determine the force F required to cause the spool rotate upward with an angular acceleration of 20 rad/s². (25%)

(背面仍有題目,請繼續作答)

4. The slender rod has a mass m and is suspended at its end A by a cord. If the rod receives a horizontal impulse I at B, determine the location y of the point P about which the rod appears to rotate during the impact.
   (25%)

Problem 4.