110A 102

國立臺北科技大學 110 學年度碩士班招生考試

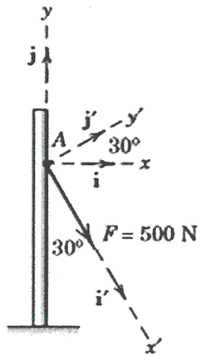
系所組別：1501 自動化科技研究所

第二節　工程力學　試題（選考）

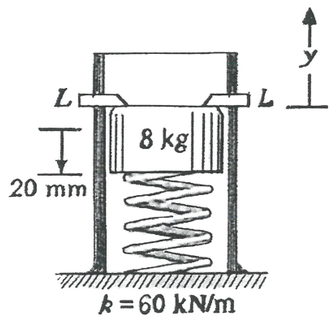
注意事項：

1. 本試題共 5 題，每題 20 分，共 100 分。
2. 不必抄題，作答時請將試題題號及答案依照順序寫在答案卷上。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

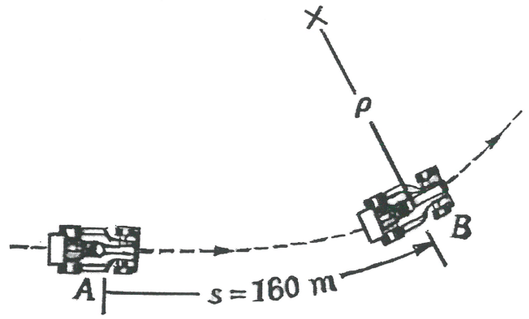
1. (20%) The 500-N force $\boldsymbol{F}$ is applied to the vertical pole as shown. (1) Write $\boldsymbol{F}$ in terms of the unit vectors **i** and **j** and identify both its vector and scalar components. (2) Determine the scalar components of the force vector $\boldsymbol{F}$ along the x'- and y'-axes. (3) Determine the scalar components of $\boldsymbol{F}$ along the x- and y'-axes. (7%) (6%) (7%)



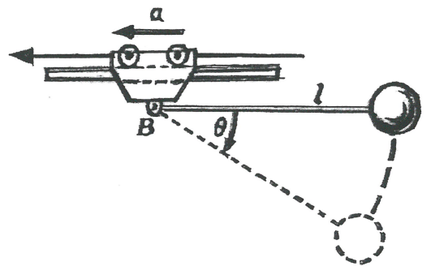
2. (20%) The 8-kg cylinder is latched in place with the 60 kN/m spring compressed a distance of 20 mm. If the two latches are simultaneously removed, determine (1) the maximum height y reached by the cylinder and (2) the velocity $\dot{y}$ of the cylinder when the spring has moved up 12 mm. The cylinder is not attached to the spring. (10%) (10%)



3. (20%) A race car going 150 km/h at a decelerates at a constant rate to 50 km/h at B in a distance s=160 m in order to negotiate on unbanked turn. If the effective coefficient of friction between tires and road is 0.80, and if the car begins to skid at B, determine the radius of curvature ρ of the path at B.



4. (20%) The point at support B for the simple pendulum of mass m and length l has a constant horizontal acceleration a as show. If it is released from rest relative to the moving system with $\theta = 0$, determine the expression for the tension T in the cord in terms of θ.



5. (20%) The mass m is brought to an equilibrium position by the application of the couple M to the end of one of the two parallel links which are hinged as shown. The links have negligible mass, and all friction is assumed to be absent. Determine the expression for the equilibrium angle θ assumed by the links with the vertical for a given value of M. Consider the alternative of a solution by force and moment equilibrium.