

國立成功大學

111學年度碩士班招生考試試題

編 號：134

系 所：航空太空工程學系

科 目：動力學

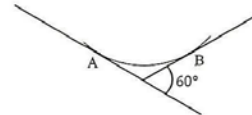
日 期：0219

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備 註：不可使用計算機

※ 考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

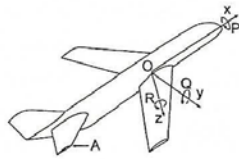
1. (a) Describe how an aircraft perform level turn flight and draw its free-body diagram. (b) The aircraft flies along the horizontal circular path AB in 60 s. If its speed at point A is 400 ft/s, which decreases at a rate of $a_t = (-0.2t)$ ft/s², determine the magnitude of the aircraft's acceleration when it reaches point B. (25%)



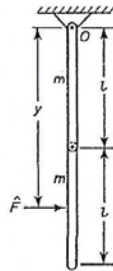
2. The 5-kg spring-loaded gun rests on the smooth surface and its muzzle has 30° elevation angle. It fires a ball having a mass of 1 kg with a velocity of 10 m/s relative to the gun. If the gun is originally at rest, determine the horizontal distance d the ball is from the initial position of the gun at the instant the ball strikes the ground at D. Neglect the size of the gun and the vertical distance between the gun and surface. (25%)

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3. As shown in the following figure, a set of coordinate $Oxyz$ is attached to the aircraft. Let the rolling rate P , pitching rate Q and the yawing rate R be all constant. Also let the velocity and the acceleration of point O relative to the ground be V_o and A_o , respectively, and the coordinate of a point A on the aircraft be (X_A, Y_A, Z_A) , determine V_A and A_A , the velocity and the acceleration of point A relative to the ground, respectively. (15%)



4. Two thin uniform rods, each of mass m and length l , are connected in tandem to form a double pendulum. Assuming that the system initially hangs motionless, find the distance y from the pivot O at which a traverse impulse F should be applied such that the two rods maintain their relative alignment immediately after the impulse is applied. (20%)



5. A rod of mass m and length l is connected by a pivot at its lower end to a block of mass m which can slide on a frictionless plane. Using x and θ as generalized coordinates, obtain the differential equations of motion. (15%)

