

國立臺灣科技大學  
八十八學年度碩士班招生考試試題

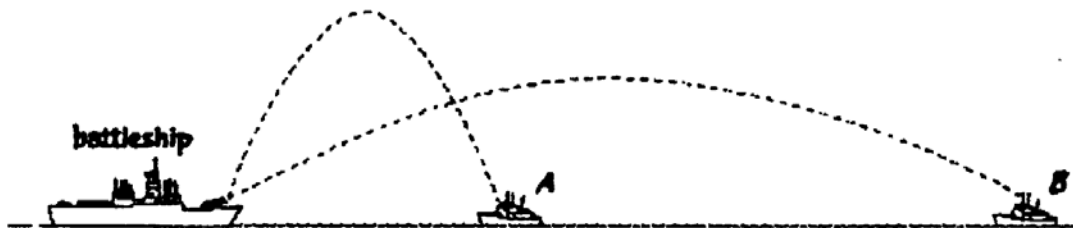
系所別：機械工程系研究所

組別：甲、丁組

科目：動力學

共四題，每題 25 分。可不依序作答，但題號務必標示清楚。解題請註明所依據的定理，自由體圖需簡明繪於答案卷上。

1. After computing the necessary fire angles, a battleship simultaneously fires two shells toward two enemy ships. As shown in the figure, enemy A is closer than enemy B. Two shells travel along the parabolic trajectories. Which of the two enemy ships will get hit first? Explain your answer by derive the time needed for the shells to hit the enemy.



2. On a smooth surface, a tennis ball impacts a heavy snooker ball initially at rest and bounces elastically from the snooker ball. After the collision, which ball has the greater momentum? Which has the greater energy? Explain your answer by derive the necessary equations for momentum and kinetic energy in terms of velocity and mass.
3. An automobile accident occurs as follows: Samprus's Cerfiro (vehicle A, 1500kg) is travelling on a dry, level road and approaches Graf's stationary Civic (vehicle B, 900 kg). Just 15 meters before collision, Johnson applies the brakes, skidding all wheels. After impact, vehicle A skids an additional 15 m and vehicle B, whose driver had all brakes fully applied also, skids 30 m. If the coefficient of kinetic friction is 0.9, should Samprus was exceeding the speed limit of 90 km/h before he initially applied his brake. Hint: You need both work and momentum principles to solve this problem.
4. Linkage OA rotates at constant clock wise speed 10 rad/sec. The slotted linkage BC is driven. At the instance  $\theta = 30$  degree, determine the relative acceleration of pin A respect to link BC.

