國立高雄應用科技大學

104 學年度研究所碩士班招生考試

模具工程系碩士班

靜力學

注意：a. 本試題共 5 題，第 1 題為選擇題(含兩小題)，第 2 題為填充題(含兩小格)，選擇題及填充題僅需列出正確答案即可，無需詳述作答過程。第 3、4 及 5 題為計算題，必須詳列計算過程或敘明理由。第 1 題為 20 分(每小題 10 分), 第 2 題為 20 分(每小格 10 分)，第 3 題為 25 分，第 4 題為 20 分，第 5 題為 15 分，總共 100 分，每題各部份的配分標示於題目中。

b. 作答時不必抄題，可以用中文或英文方式作答。

c. 考生作答前請詳閱答案卷之考生注意事項。

1. Three forces F_1=8N, F_2=32N and F_3=40N, and a couple of magnitude M=500N-mm as shown in **Fig.1** are applied to a right-angle bracket AOB. Reduce the force system to an equivalent force-couple system.

(a) Find the resultant force (**R**) of this force system (10%):

(A) **R** = -14.627 **i** + 17.373 **j** (N);　(B) **R** = 17.373 **i** - 14.627 **j** (N);

(C) **R** = -17.373 **i** - 14.627 **j** (N);　(D) **R** = 17.373 **i** +14.627 **j** (N);

(E) **R** = 14.627 **i** + 17.373 **j** (N).

(b) Find the locations (x_{OA}, 0) and (0, y_{OB}) of points where the line of action of the resultant intersects line OA and line OB (10%) :

(A) (x_{OA}, 0) = (–63.32 mm, 0 mm), (0, y_{OB})= (0 mm, 75.20 mm);

(B) (x_{OA}, 0) = (75.20 mm, 0 mm),　(0, y_{OB})= (0 mm, –63.32 mm);

(C) (x_{OA}, 0) = (–75.20 mm, 0 mm), (0, y_{OB})= (0 mm, 63.32 mm);

(D) (x_{AB}, 0) = (–75.20 mm, 0 mm), (0, y_{OB})= (0 mm, –63.32 mm);

(E) (x_{OA}, 0) = (63.32 mm, 0 mm),　(0, y_{OB})= (0 mm, –75.20 mm).

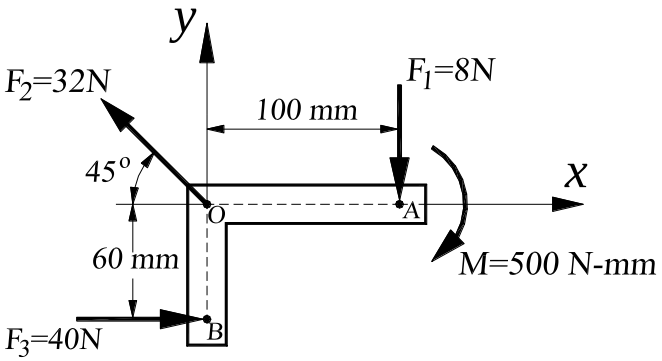


Fig.1

2. Figure 2 shows a rectangular plate *OPQR* which weighs 100 *N* and is held by two revolute hinges at *A* and *B* and supported by cable *FH*. Assuming the hinge at *B* does not exert any axial thrust force. Determine:

(a) *Tension force in the cable FH =* _____ *N*; (10%)

(b) *The magnitude of the reaction force at B =* _____*N*. (10%)

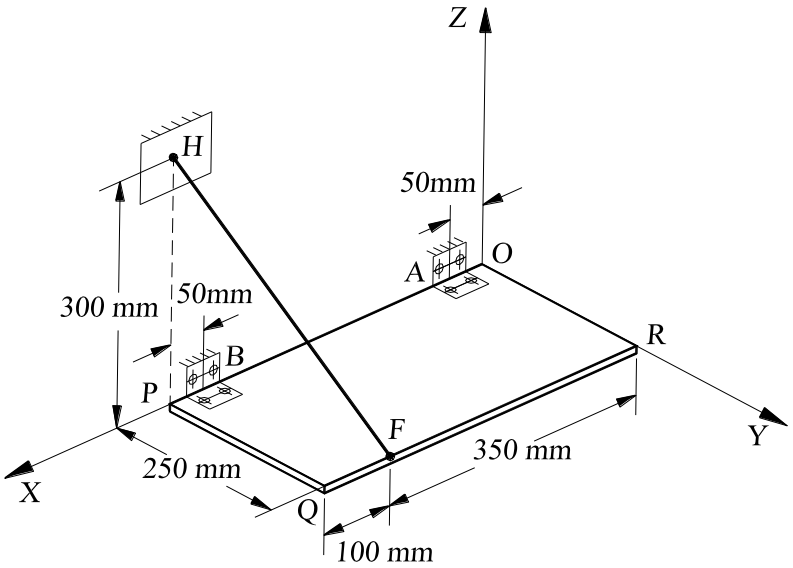


Fig.2

3. Figure 3 shows the frame and its loadings *P*=10 *kN* and *M*=10 *kN-m*. Bar *AC* is a two-force member and there is a roller support at *A*.

(a) Find the reaction forces at *A* and *D*. (10%)

(b) Determine the components of all forces acting on the member *BCD*. (10%)

(c) Determine the force acting on the two-force member *AC*, and state whether it is in tension or compression. (5%)

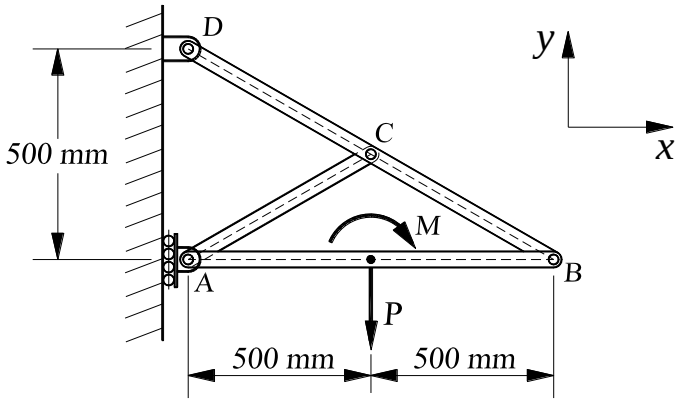


Fig.3

4. A 500*N* block is pulled by using a force *F* as shown in **Fig.4**. The coefficient of static friction between the block and the ground is 0.30. If ϕ=45 degrees, determine:

(a) The magnitude of the force *F* required to move the block. (10%)

(b) Whether the block will tip or slide under the force of *Part* (a). (5 %)

If ϕ=60 degrees, determine:

(c) Is it possible to tip under the force of *Part* (a)? (5%)

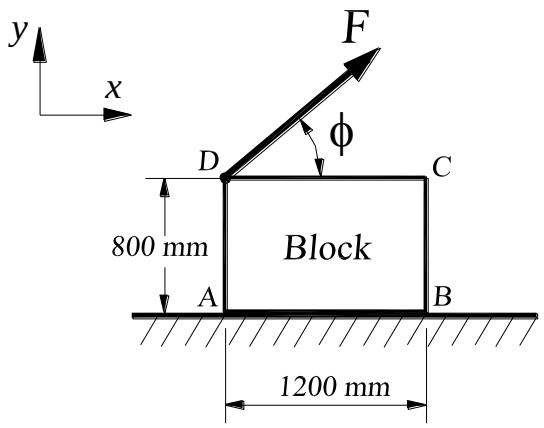


Fig.4

5. A rectangular area *ABCD* has a size of $a \times b$ as shown in **Fig.5a**.

(a) Determine the moment of inertia (I_x) of a rectangular area with respect to its base by the direct integration (*Hint*:$I_x=\int y^2 dA$) (5%);

(b) Using the result of part (a), determine the moment of inertia (I_x) of an *I*-shaped area as shown in **Fig.5b** with the help of the parallel-axis theorem. (10%)

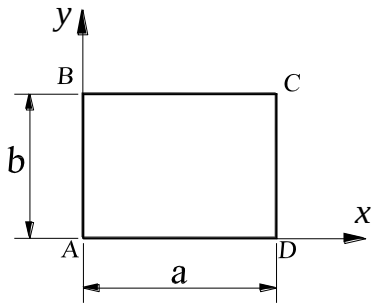
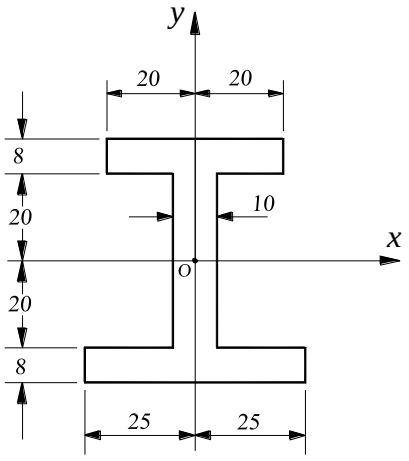


Fig.5a



Unit: minimeter(mm)

Fig.5b