

本試題是否可以使用計算機： 可使用， 不可使用（請命題老師勾選）

1. Please translate the following sentences to Chinese
  - (a) (13 %) The challenges that face today's scientific and engineering community require the ability to cross disciplines easily in order to use technology and research results to empower both individuals and entire societies. Design engineering is no exception since it is characterized by its philosophy, methods, and approaches to solving problems that are intrinsically multi-disciplinary. It is a unique blend of a systems philosophy and a creative problem-solving and design framework.
  - (b) (12%) Microsoft launched its new operating system, Windows Vista, recently. One big change which Microsoft is introducing with Vista is a technology called PatchGuard. This keeps an eye on the core, or kernel, of Windows Vista and stops unauthorized programs making changes. It could help avoid many malicious or unwanted programs that try to embed themselves in Windows. (Vista, PatchGuard 可直接使用原文)
  
2. Four fasteners (A, B, C, D) used in the bracket shown have a same size of diameter. Two shear loads are acting on the fasteners. One is the direct shear due to force and the other due to moment is the tangential shear which is perpendicular to the centroid (C.G.) of four fasteners. The magnitude of the tangential shear at each fastener is proportional to the distance from the C.G.
  - (a) (6%) Draw the free body diagram on fasteners due to applied force.
  - (b) (12%) If  $P=1000$  N, determine both magnitude and direction of the total shear force on these fasteners (A, B, C, D).
  - (c) (7%) If the fastener is capable of standing a 2000 N shear force, estimate the maximum applied force (P) on the bracket.

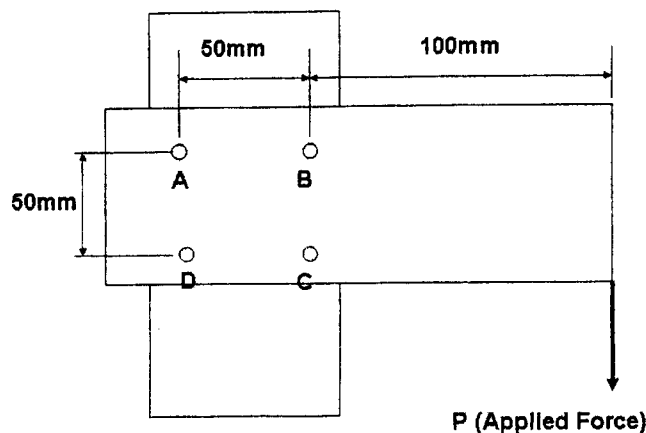


Figure P2.

(背面仍有題目,請繼續作答)

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3. The Figure P3 shows a bevel gear attached to a shaft supported by self-aligning bearings at A and B and driven by a motor. Axial ( $F_a$ ) and radial ( $F_r$ ) components of the gear force are known. The tangential or torque-producing component is perpendicular to the plane of the paper and has a magnitude of 2000 N. Bearing A takes thrust, B does not. Dimensions are in millimeters.

(a) (10%) Find the reaction forces in bearings A and B.

(b) (15%) To what values of axial load and torque is the shaft subjected, and what portion(s) of the shaft experience these loads?

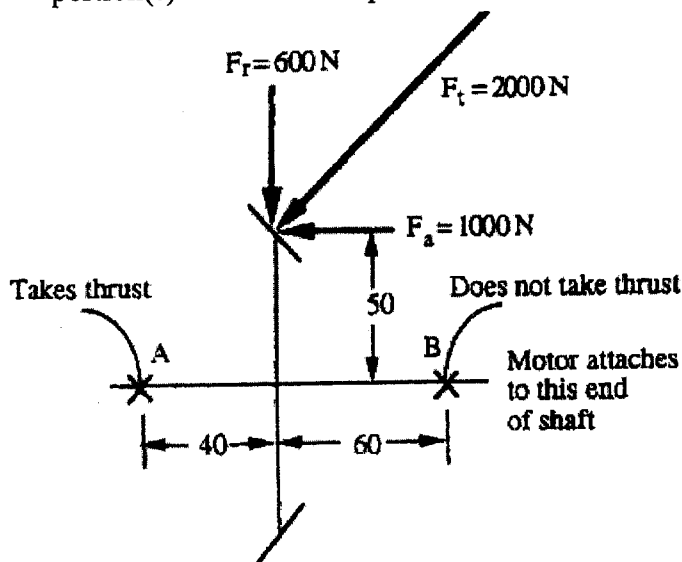


Figure P3.

4. (25%) Using the method of virtual work, determine the magnitude of a force  $Z$  for equilibrium of a crank-slider mechanism (Figure P4) in the position given by the angle  $\varphi = 30^\circ$ . Given is  $M = 50\text{ Nm}$ ,  $Q = 35\text{ N}$ ,  $r = 0.1\text{ m}$ .

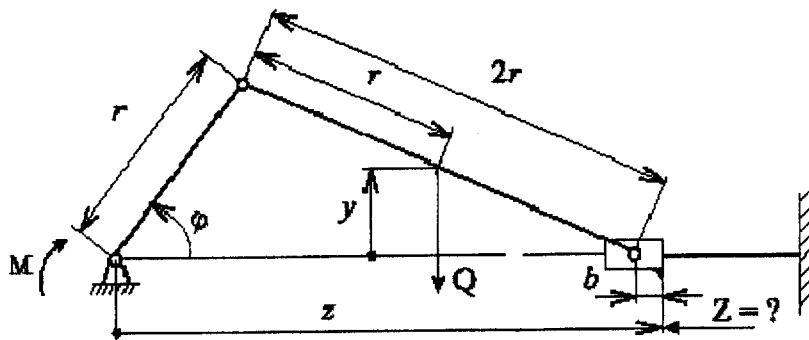


Figure P4.