

國立臺灣科技大學

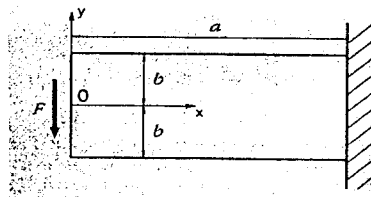
九十二學年度博士班招生考試試題

系所組別：機械工程系博士班甲一組

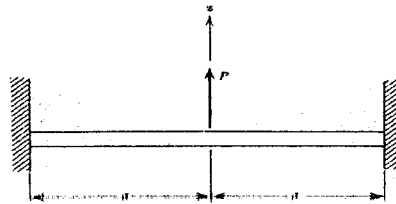
科目：彈性力學

總分 100 分

1. A rectangular beam, $0 < x < a, -b < y < b$, is subjected to a transverse force F at the end $x = 0$, and built-in at the end $x = a$. The horizontal boundaries $y = \pm b$ are traction-free. Use the stress function to find the stress components in the beam. (25%)



2. Consider a clamped, circular plate with radius a , acted upon by a transverse, concentrated load of magnitude P at the center of the plate. Find the transverse displacement w of the plate, the flexural rigidity of which is D . Note that $\nabla^2 w = \frac{1}{r} \frac{d}{dr} \left(r \frac{dw}{dr} \right)$ where r is a polar coordinate. (25%)



3. Explain
- the relation between the principle of total potential energy (the principle of virtual work), the differential equation of equilibrium and admissible displacement field.
 - the relation between the principle of total complementary potential energy (the principle of complementary virtual work), the condition of compatibility and admissible stress field. (25%)
4. At a point P in a solid, the stress tensor components referred to (x_1, x_2, x_3) axes

$$\text{are given by } [\sigma_{ij}] = \begin{bmatrix} 3 & 1 & 1 \\ 1 & 0 & 2 \\ 1 & 2 & 0 \end{bmatrix}.$$

Find (a) the principal stresses at P .

- (b) the orientation of the three principal stress axes. The principal stress axes should form a right-hand triad. (25%)

