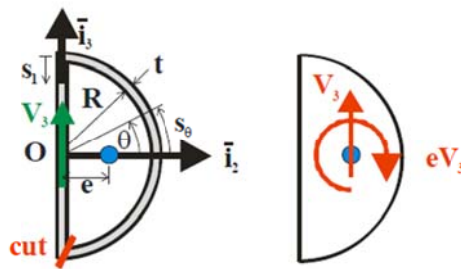


## 2012년도 2학기 항공기 구조역학 기말고사

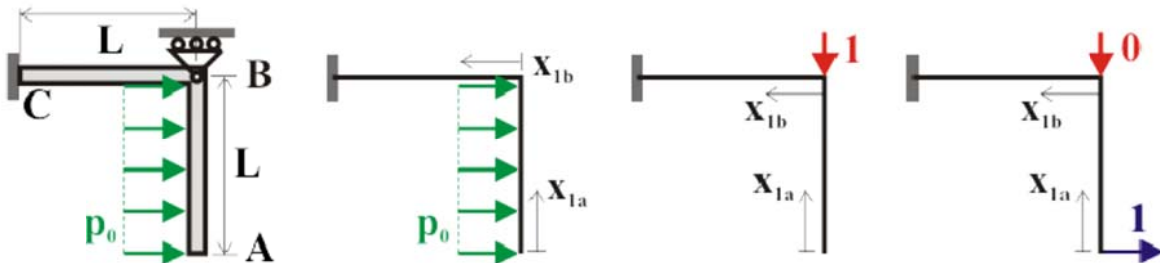
1. A beam with the closed semi-circular thin-walled cross-section shown in figure is subjected to a vertical shear force,  $V_3$ , with a line action passing through the section's vertical web.

- (1) Determine the location of the section's shear center. (10 points)
- (2) Determine the shear flow distribution due to shearing. (5 points)
- (3) Determine the shear flow distribution due to torsion. (5 points)
- (4) Determine the total shear flow distribution. (5 points)



2. Consider the cantilevered beam consisting of two segments of length  $L$  connected at a 90 degree angle, as shown in figure. A simple support is located at point  $B$ , and a distributed horizontal load,  $p_0$ , is acting along segment  $BA$ .

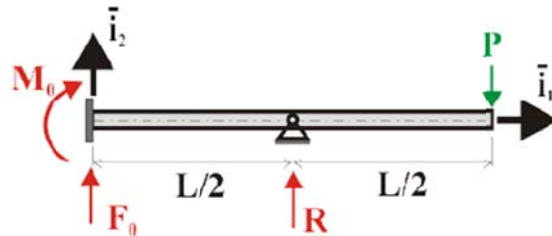
- (1) Find the magnitude and location of the maximum bending moment in the bent beam. (15 points)
- (2) Find the horizontal tip deflection at point A. (10 points)



3. A cantilevered beam with a mid-span support carries a tip concentrated load,  $P$ , as depicted in figure.

(1) Using the principle of least work, determine the reaction forces. (15 points)

(2) Find the bending moment distribution in the beam. (10 points)



4. The uniform circular beam with centerline radius  $R$  shown in figure is clamped at point  $A$  and constrained to move in the only in the vertical direction at point  $B$ , where it is also subjected to an applied vertical load,  $P$ . (Consider only bending deformation.)

(1) Find the displacement,  $\Delta$ , in the direction of the applied load. (15 points)

(2) Find the horizontal reaction  $Q$  at point  $B$ . (5 points)

(3) Find the equivalent spring constant  $k = P/\Delta$ . (5 points)

