臺灣綜合大學系統114學年度學士班轉學生聯合招生考試試題

科目名稱	材料力學	類組代碼	D37
		科目碼	D3793

※本項考試依簡章規定所有考科均「不可」使用計算機。　　本科試題共計 1 頁

1. A steel pipe of thickness t_s and an aluminum pipe of thickness t_a are securely bonded together to form a composite cylinder. The aluminum pipe has an inner radius r_o, and the cross-section of the composite cylinder is shown in Fig.1. For the steel, the Young's modulus is E_s and the Poisson's ratio is ν_o, while for the aluminum, the Young's modulus is E_a and the Poisson's ratio is also ν_o.

   (a) Given that the composite cylinder is subjected to a force P applied at the origin along the positive x-axis, determine the maximum stress in both the aluminum and the steel, as well as the change in the inner radius of the steel. (20%)

   (b) Given that the composite cylinder is subjected to a force P applied at $y = r_o$ along the positive x-axis, determine the maximum stress in both the aluminum and the steel. (15%)

   (c) Given that the composite cylinder is subjected to a force P applied at $y = r_o$ along the positive z-axis and another force P applied at $y = -r_o$ along the negative z-axis, determine the maximum stress in both the aluminum and the steel. (15%)

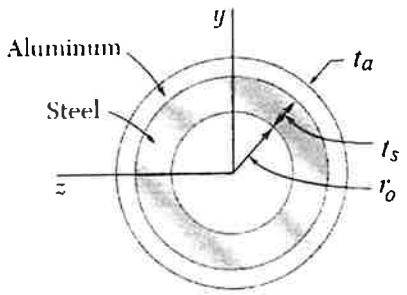

Fig. 1

2. A beam AB of length L, width b and height h undergoes a temperature change such that the top of the beam is at temperature T_1 and the bottom of the beam is at temperature T_2. Assume that the beam AB has an elastic modulus E and a thermal expansion coefficient α.

   (a) If the beam AB is simply supported, as shown in Fig.2(a), and $T_1 > T_2$, find the maximum deflection of the beam and the reactions at supports A and B. (15%)

   (b) If both ends A and B are fixed, as shown in Fig.2(b), and $T_1 = T_2$, find the maximum deflection of the beam and the reactions at the ends A and B. (15%)

   (c) If both ends A and B are both fixed, as shown in Fig.2(b), and $T_1 < T_2$, find the maximum deflection of the beam and the reactions at the ends A and B. (20%)

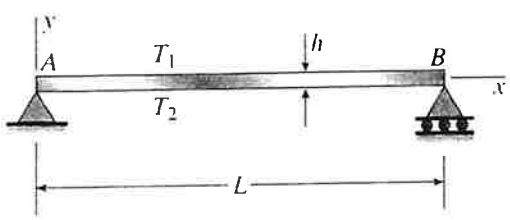

Fig.2(a)

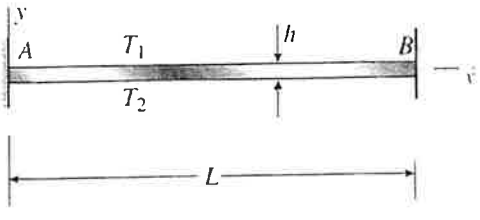

Fig.2(b)