淡江大學九十四學年度轉學生招生考試試題

系別：機械與機電工程學系三年級　科目：工程力學(含靜力學、動力學、材料力學)

准帶項目請打「V」	
V	簡單型計算機

節次：7 月 13 日第三 節

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本試題雙面印製

1. Determine the horizontal and vertical components of reaction for the beam loaded as shown in Fig. 1. Neglect the weight of the beam in the calculations. (15%)

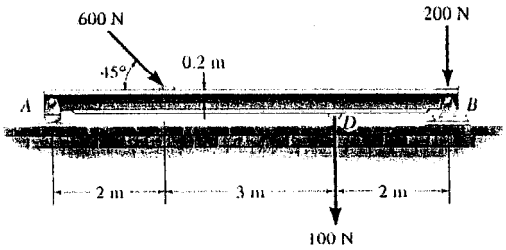

Fig. 1

2. Draw the shear and moment diagrams for the cantilevered beam shown in Fig. 2. (15%)

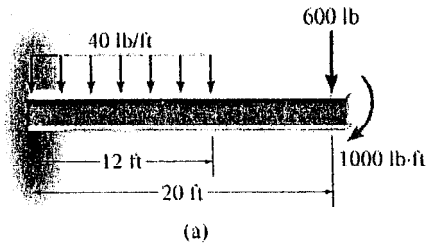

Fig. 2

3. The ram R shown in Fig. 3 has a mass of 100kg and is released from rest 0.75m from the top of a spring A, that has a stiffness $k_A = 12\text{kN/m}$. If a second spring B, having a stiffness $k_B = 15\text{kN/m}$, is "nested" in A, determine the maximum displacement of A needed to stop the downward motion of the ram. The unstretched length of each spring is indicated in the figure. Neglect the mass of the springs. (15%)

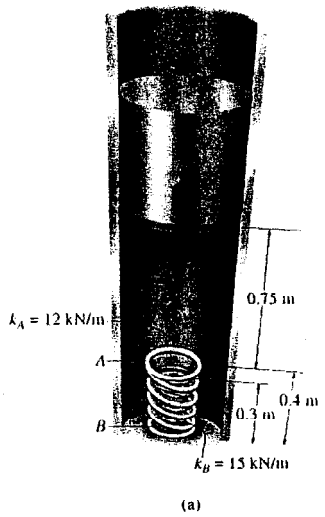

Fig. 3

4. At a given instant, the cylinder of radius r, shown in Fig. 4, has an angular velocity ω and angular acceleration α. Determine the velocity and acceleration of its center G if it rolls without slipping. (15%)

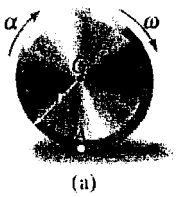

Fig. 4

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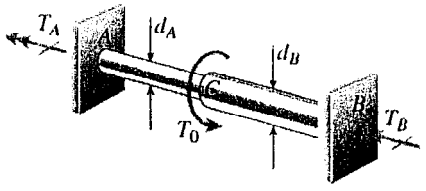
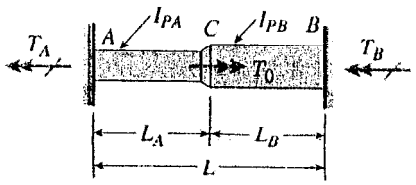
5. The bar ACB shown in Fig. 5a and b is fixed at both ends and loaded by a torque T_0 at point C. Segments AC and CB of the bar have diameters d_A and d_B, lengths L_A and L_B, and polar moments of inertia I_{PA} and I_{PB}, respectively. The material of the bar is the same throughout both segments.

Obtain formulas for (a) the reactive torques T_A and T_B at the ends, (b) the maximum shear stresses τ_{AC} and τ_{CB} in each segment of the bar, and (c) the angle of rotation ϕ_C at the cross section where the load T_0 is applied. (20%)



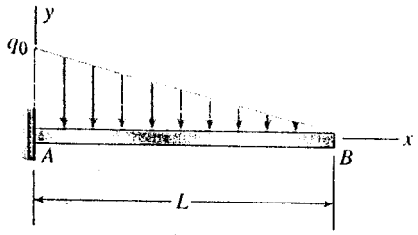
(a)



(b)

Fig. 5

6. Determine the equation of the deflection curve for a cantilever beam AB supporting a triangularly distributed load of maximum intensity q_0 (Fig. 6a). Also, determine the deflection δ_B and angle of rotation θ_B at the free end (Fig. 6b). Use the fourth-order differential equation of the deflection curve (the load equation). (Note: The beam has length L and constant flexural rigidity EI.) (20%)



(a)

(b)

Fig. 6