44-1

淡江大學 105 學年度日間部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)

考試日期：7 月 22 日(星期五) 第 3 節　　本試題共 6 大題， 2 頁

本試題雙面印刷

1. What is the moment of the force $\vec{F} = 2\vec{i} - 3\vec{j} + 6\vec{k}$ kN about the axis of the bar BC shown in Fig. 1? (15%)

2. The force $\vec{F} = 40\vec{i} - 32\vec{j} + 60\vec{k}$ kN acting on the boom ABC at C points shown in Fig. 2. The boom is supported by a ball and socket at A and the cables BD and BE. The collar at B is fixed to the boom. (a) Draw the free-body diagram of the boom. (b) Determine the tensions in the cables and the reactions at A. (20%)

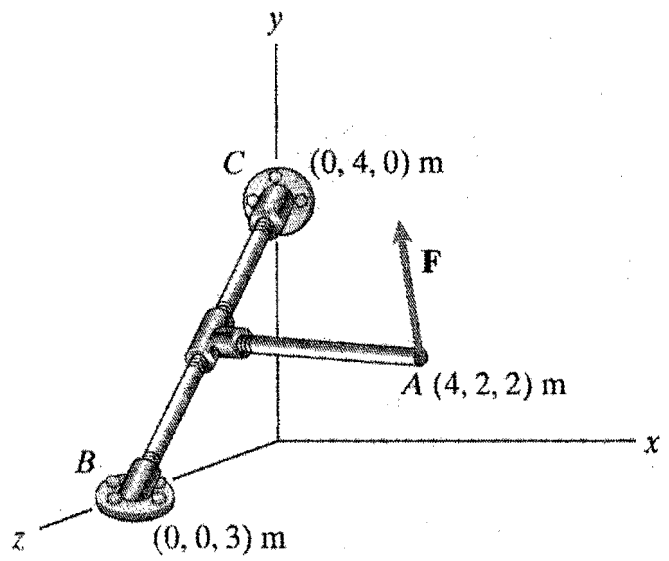

Fig. 1

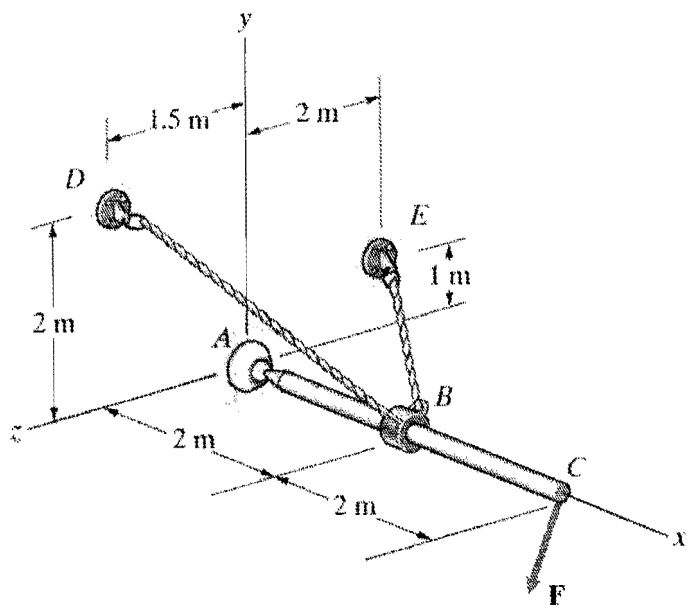

Fig. 2

3. The two crates are released from rest shown in Fig.3. Their masses are $m_A = 30$ kg and $m_B = 45$ kg, and the coefficients of friction between crate A and the inclined surface are $\mu_s = 0.2$ and $\mu_k = 0.15$. What is the acceleration of the crates? (15%)

4. Bar AB has a counterclockwise angular velocity of 15 rad/s and a clockwise angular acceleration of 200 rad/s^2 shown in Fig.4. What are the angular velocities and the angular accelerations of bars BC and CD? (15%)

5. A pressurized circular cylinder has a sealed cover plate fastened with steel bolts (see Fig. 5). The pressure P of the gas in the cylinder is 2MPa, the inside diameter D of the cylinder is 200mm, and the diameter d_b of the bolts is 10mm. If the allowable tensile stress in the bolts is 100MPa, find the number n of bolts needed to fasten the cover. (15%)

背面尚有試題

淡江大學 105 學年度日間部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)

考試日期：7 月 22 日(星期五) 第 3 節　　本試題共 6 大題， 2 頁

6. A trimetallic bar is uniformly compressed by an axial force $P = 20\text{kN}$ applied through a rigid end plate (see Fig. 6). The bar consists of a circular steel core surrounded by brass and copper tubes. The steel core has diameter 10mm, the brass tube has outer diameter 15mm, and the copper tube has outer diameter 20mm. The corresponding moduli of elasticity are $E_s = 200\text{GPa}$, $E_b = 100\text{GPa}$, and $E_c = 150\text{GPa}$. Calculate the compressive stresses σ_s, σ_b, and σ_c in the steel, brass, and copper, respectively, due to the force P. (20%)

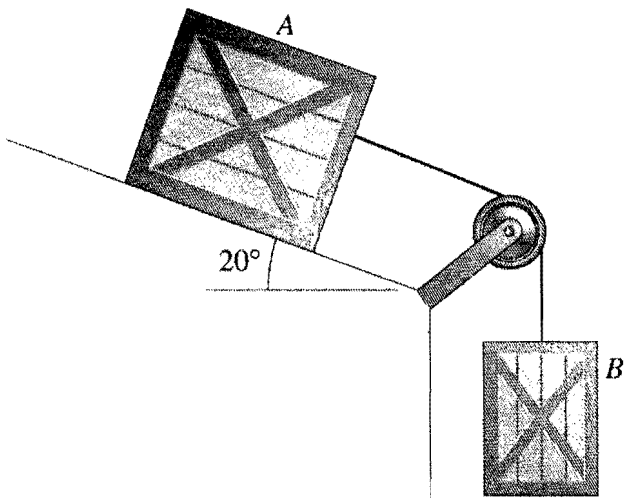

Fig. 3

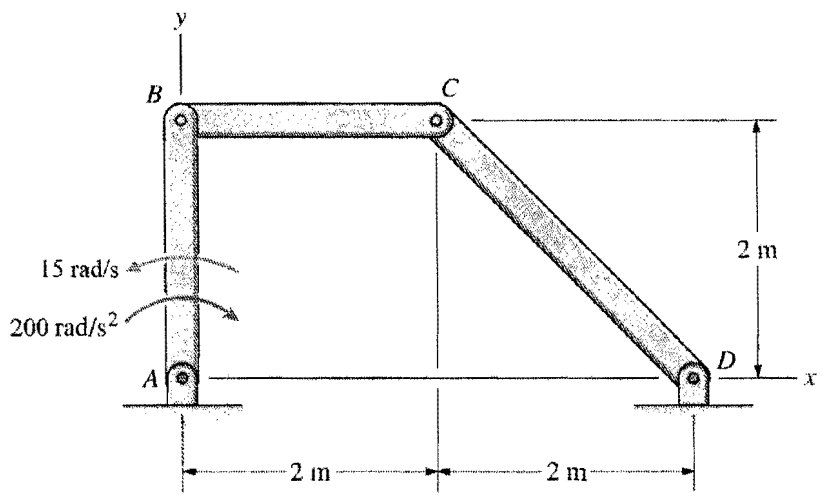

Fig. 4

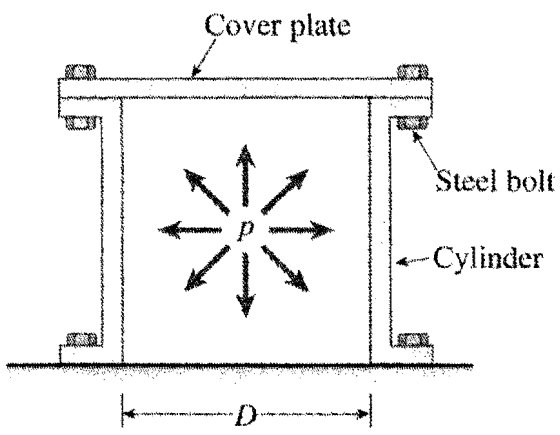

Fig. 5

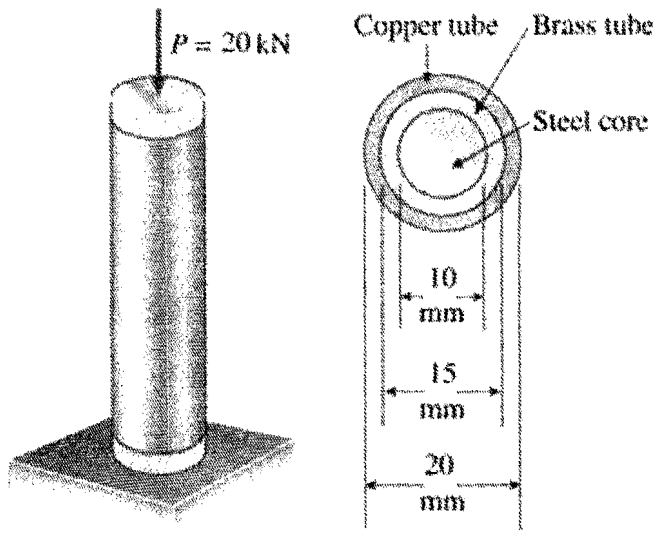

Fig. 6