國立成功大學
110學年度碩士班招生考試試題

編　號：116

系　所：工程科學系

科　目：材料力學

日　期：0203

節　次：第 2 節

備　註：可使用計算機

編號： 116

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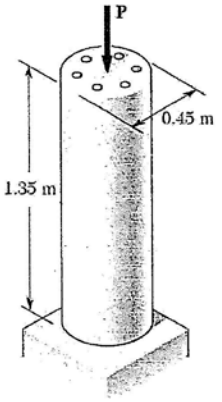
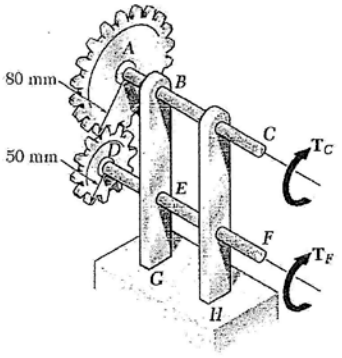
※ 考生請注意：本試題可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. (20pts) Explain the following terms:
   (a) principle of superposition, (b) isotropic material, (c) factor of safety (d) bulk modulus, (e) elastic section modulus, (f) maximum-shearing-stress criterion, (g) stress-concentration factor, (h) shear strain, (i) elastic torsion formula, (j) strain energy density.

2. (10pts) The 1.35 m concrete post is reinforced with six steel bars, each with a 28 mm diameter. Knowing that $E_s = 200$ GPa and $E_c = 29$ GPa, determine the normal stresses in the steel and in the concrete when a 1560 kN axial centric force **P** is applied to the post.



3. (10pts) The two solid shafts are connected by gears as shown and are made of a steel for which the allowable shearing stress is 60 MPa. Knowing that a 600 N·m torque $\mathbf{T}_C$ is applied at *C*, determine the required diameter of (a) shaft *BC*, (b) shaft *EF*.



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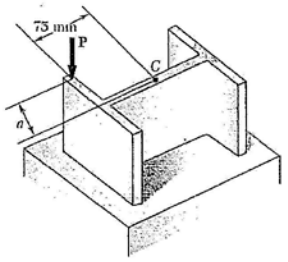
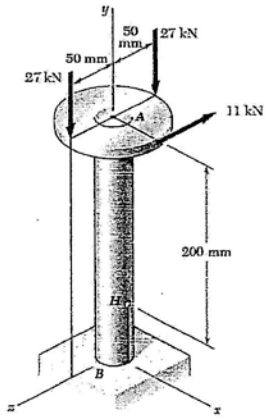
4. (20pts) An axial load **P** of magnitude 50 kN is applied as shown to a short section of a W150 × 24 rolled-steel member. Determine the largest distance a for which the maximum compressive stress does not exceed 90 MPa. For W 150 × 24 rolled steel section: $A = 3060$ mm^2, $I_z = 13.4 \times 10^6$ mm^4, $I_y = 1.83 \times 10^6$ mm^4, $d = 160$ mm and $b_f = 102$ mm.



5. (20pts) Three forces are applied to 100 mm diameter plate that is attached to the solid 46 mm diameter shaft AB. At point H, determine (a) the principal stresses and principal planes, (b) the maximum shearing stress.



6. (20pts) For the beam shown, determine the reaction at the roller support when $w_0 = 15$ kN/m.