

國立中山大學 113 學年度 碩士班暨碩士在職專班招生考試試題

科目名稱：材料力學【機電系碩士班乙組】

— 作答注意事項 —

考試時間：100 分鐘

- 考試開始鈴響前不得翻閱試題，並不得書寫、劃記、作答。請先檢查答案卷（卡）之應考證號碼、桌角號碼、應試科目是否正確，如有不同立即請監試人員處理。
- 答案卷限用藍、黑色筆(含鉛筆)書寫、繪圖或標示，可攜帶橡皮擦、無色透明無文字墊板、尺規、修正液（帶）、手錶(未附計算器者)。每人每節限使用一份答案卷，請衡酌作答。
- 答案卡請以 2B 鉛筆劃記，不可使用修正液（帶）塗改，未使用 2B 鉛筆、劃記太輕或污損致光學閱讀機無法辨識答案者，後果由考生自負。
- 答案卷（卡）應保持清潔完整，不得折疊、破壞或塗改應考證號碼及條碼，亦不得書寫考生姓名、應考證號碼或與答案無關之任何文字或符號。
- 可否使用計算機請依試題資訊內標註為準，如「可以」使用，廠牌、功能不拘，唯不得攜帶書籍、紙張（應考證不得做計算紙書寫）、具有通訊、記憶、傳輸或收發等功能之相關電子產品或其他有礙試場安寧、考試公平之各類器材入場。
- 試題及答案卷（卡）請務必繳回，未繳回者該科成績以零分計算。
- 試題採雙面列印，考生應注意試題頁數確實作答。
- 違規者依本校招生考試試場規則及違規處理辦法處理。

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題號：438006

※本科目依簡章規定「可以」使用計算機（廠牌、功能不拘）（問答申論題）

共 1 頁第 1 頁

1. (20%) Explain the following terminologies.
 - (1) Idealized elastoplastic material
 - (2) Engineering stress and true stress
 - (3) Statically indeterminate beams
 - (4) Tresca and von-Mises yield criteria
 - (5) Pin-ended column

2. (20%) Rod ABC consists of two cylindrical portions AB and BC as shown in Fig. P2; it is made of a mild steel that is assumed to be ideally elastoplastic with $E=200$ GPa and $\sigma_Y=250$ MPa. A force P is applied to the rod and then removed to give it a permanent set $\delta_p=2$ mm. Determine the maximum value of the force P and the maximum amount δ_m by which the rod should be stretched to give it the desired permanent set.

3. (20%) A copper strip ($E_c = 105$ GPa) and an aluminum strip ($E_a = 75$ GPa) are bonded together to form the composite beam shown in Fig. P3. Knowing that the beam is bent about a horizontal axis by a couple of moment $M = 35$ N·m, determine the maximum stress in (a) the aluminum strip, (b) the copper strip.

4. (20%) A spherical pressure vessel has an outer diameter of 3 m and a wall thickness of 12 mm. Knowing that for the steel used $\sigma_{all} = 80$ MPa, $E = 200$ GPa, and $\nu = 0.29$, determine (a) the allowable gage pressure, (b) the corresponding increase in the diameter of the vessel.

5. (20%) The state of stress shown in Fig. P5 occurs in a machine component made of a brass for which $\sigma_{Yield} = 160$ MPa. Using the maximum-distortion-energy criterion, determine whether yield occurs when (a) $\sigma_z = +45$ MPa, (b) $\sigma_z = -45$ MPa.

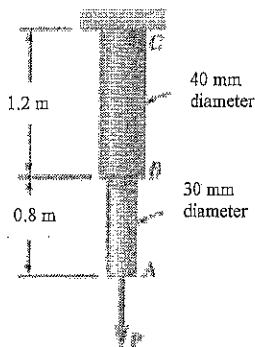


Fig. P2

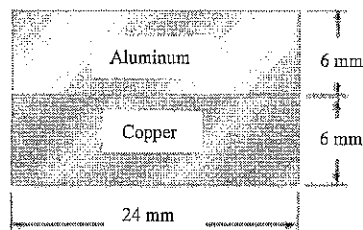


Fig. P3

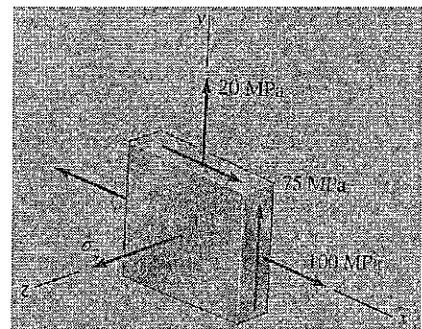


Fig. P5