

# 國立中山大學 114 學年度 碩士班考試入學招生考試試題

科目名稱：電磁學【電機系碩士班戊組、通訊所碩士班乙組、電波聯合碩士班】

## —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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科目名稱：電磁學【電機系碩士班戊組、通訊所碩士班乙組、電波聯合碩士班】題號：482004

※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. (25%) Find the electric field intensity between two large parallel conducting plates as shown in the Fig.
  1. The volume density of charge between these two plates is  $\rho_v = \frac{-\rho_0 y}{h}$ . A voltage  $V_0$  is applied to two plates which are separated by a distance  $h$ . Assume that the fringing effect at the edges is negligible.
2. (25%) Two long parallel conducting wires of radius  $b$  carry currents in opposite directions. The axes of the wires are separated by a distance  $L$ . Determine the internal and external inductances per unit length of this two-wire transmission line. Assume that  $L \gg b$ .
3. (5%) For a TEM wave propagating in the  $+x$  direction, write the traveling-wave factor in frequency domain and time domain, respectively.
4. (5%) Can a negative elliptically polarized wave be a TEM wave at the same time? Please explain your idea in detail.
5. (10%) As shown in Fig. 2, for a coaxial line operated in TEM mode, find electric field intensity, magnetic field intensity, and surface current density on the two conductors.
6. (15%) Please refer to Fig. 3, a uniform plane wave of an angular frequency  $\omega$  is incident from air on a dielectric at an angle of incidence  $\theta_i$  with parallel polarization. Prove

$$1 + \Gamma = \tau \times \frac{\cos \theta_t}{\cos \theta_i}$$

where  $\Gamma$  and  $\tau$  are respectively the reflection coefficient and transmission coefficient.

7. (15%) The circuit which contains transmission lines and resistors is shown in Fig. 4. Find  $Z_{in}$  and voltage ratio of  $V_2/V_1$ .

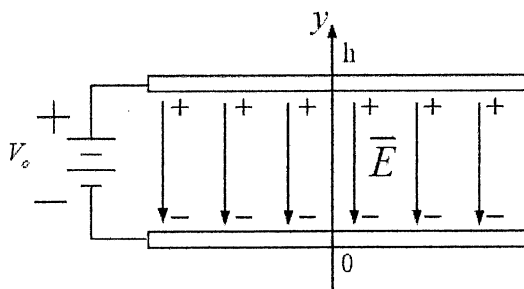


Fig. 1

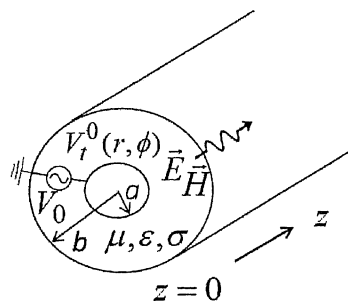


Fig. 2

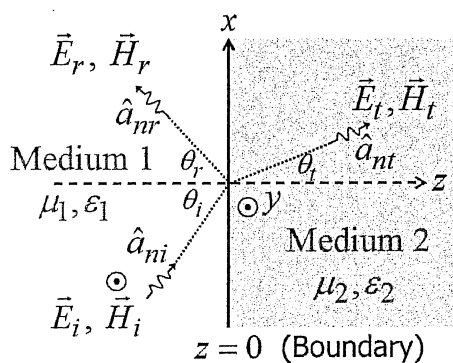


Fig. 3

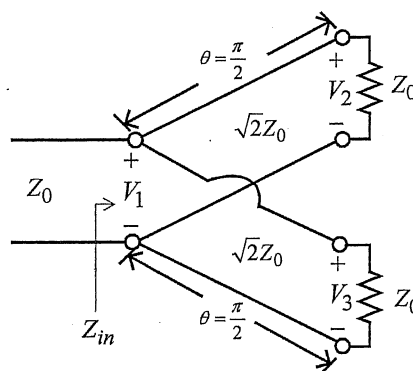


Fig. 4