# 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：離散數學【電機系碩士班丙組】**

—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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科目名稱：離散數學【電機系碩士班丙組】　　題號：431010

※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）　

1. Assume that $\sqrt{x^2+13}$ is a discrete number. Find the solution to $x$. Please justify your answer to receive full credit. Failure to provide justification will result in 0 points. Additionally, write your final answer at the leftmost part of the answer paper using "Ans:" on a new separate line. Failure to follow this instruction will result in a penalty of −5 points. (5pt)

2. Solve $\begin{aligned} x_n &= 4x_{n-1} + 3y_{n-1} \\ y_n &= 3y_{n-1} + 2x_{n-1} \\ x_0 &= 7,\ y_0 = 7 \end{aligned}$

Please justify your answer to receive full credit. Failure to provide justification will result in 0 points. Additionally, write your final answer at the leftmost part of the answer paper using "Ans:" on a new separate line. Failure to follow this instruction will result in a penalty of −5 points. (15pt)

3. A basket contains four apples, $y$ oranges, and $z$ melons. Two items are randomly selected from the basket. Let $x$ represent the number of apples picked. The probability of selecting two apples is 1/6, and the probability of selecting one apple and one orange is 1/3. Assume that the expected value of $x$ is $E(x)$. Then, what is $(y-z)\times E(x)$? Please justify your answer to receive full credit. Failure to provide justification will result in 0 points. Additionally, write your final answer at the leftmost part of the answer paper using "Ans:" on a new separate line. Failure to follow this instruction will result in a penalty of −5 points. (15pt)

4. Arrange the letters $x, x, y, y, z$, and $z$ into a 3×2 grid (3 rows and 2 columns) such that: Each row contains two different letters. Each column contains three different letters. How many distinct arrangements are there? Please justify your answer to receive full credit. Failure to provide justification will result in 0 points. Additionally, write your final answer at the leftmost part of the answer paper using "Ans:" on a new separate line. Failure to follow this instruction will result in a penalty of −5 points. (15pt)

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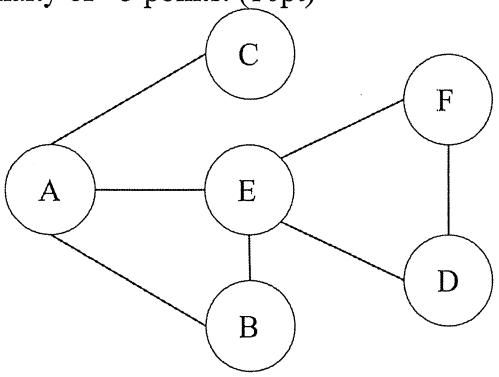
5. What is the probability that, among all possible Depth-First Search (DFS) traversals starting from node A, node F is visited before node B while nodes F and B are not visited consecutively? Please justify your answer to receive full credit. Failure to provide justification will result in 0 points. Additionally, write your final answer at the leftmost part of the answer paper using "Ans:" on a new separate line. Failure to follow this instruction will result in a penalty of −5 points. (10pt)




6. Transform $(p \to q) \to (q \wedge r)$ into its principal conjunctive normal form. Ensure the following:

- The elements $p$, $q$, and $r$ are ordered alphabetically.
- Within each parenthesis, terms with more negation signs are placed at the end.

Please justify your answer to receive full credit. Failure to provide justification will result in 0 points. Additionally, write your final answer at the leftmost part of the answer paper using "Ans:" on a new separate line. Failure to follow this instruction will result in a penalty of −5 points. (20pt)

7. A task requires selecting two people from A, B, C, and D to complete it. Based on the following conditions, determine the number of valid assignments and list all possible combinations:

1. If A is selected, then either C or D must also be selected.
2. B and C cannot both be selected.
3. If C is selected, then D must not be selected.

Please justify your answer to receive full credit. Failure to provide justification will result in 0 points. Additionally, write your final answer at the leftmost part of the answer paper using "Ans:" on a new separate line. Failure to follow this instruction will result in a penalty of −5 points. (20pt)