

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：離散數學【資工系碩士班甲組】

—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：434004

※本科目依簡章規定「不可以」使用計算機(問答申論題)

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There are 10 problems in this test. Note that you should write down detailed steps for the solution to each problem; otherwise, no credits for that problem will be given.

1. [10%] In how many ways can we distribute nine identical white balls into three distinct buckets so that the third bucket has an even number of balls in it?
2. [10%] Among the 800 three-digital integers (from 200 to 999) those such as 222, 363, 505, 989, where the integer is the same whether it is read from left to right or from right to left, are called palindromes. Without actually determining all of these three-digital palindromes, what is the sum of them?
3. [10%] Prove that the number of primes is infinite.
4. [10%] If we can guarantee that a and b are relatively prime, there exists an inverse of a under modulo b as $a^{-1} \pmod{b}$. How can we find out a^{-1} using Euclidean algorithm? (Hint: If c is the greatest common divisor of a and b , there exists a linear equation, $\exists x, y$ such that $ax + by = c$.)
5. [10%] How many three-factor unordered factorizations, where each factor is greater than 1, are there for 389,298?
6. Each of the following functions $f: \mathbb{Z} \times \mathbb{Z} \rightarrow \mathbb{Z}$ is a closed binary operation on $\mathbb{Z}$. Determine in each case whether f is commutative and/or associative?
 - (a) [5%] $f(x, y) = 7x + 17y - 119xy$
 - (b) [5%] $f(x, y) = x^{3x+7} + y$
7. Let $A = \{3, 5, 9, 11, 13, 17\}$. How many symmetric relations on A contain exactly
 - (a) [5%] three ordered pairs?
 - (b) [5%] six ordered pairs?
8. [10%] In how many ways can 2800 identical books be divided, in packages of 50, among 5 student groups so that each group get at least 200, but not more than 600 of the books?
9. [10%] Solve the recurrence relation, $a_{n+2} + a_n = 0, n \geq 0, a_0 = 1, a_1 = 5$.
10. [10%] Solve the recurrence relation, $a_{n+2} - 8a_{n+1} + 15a_n = 0, n \geq 0, a_0 = 1, a_1 = 6$ by the method of generating functions.