

Ordinary Differential Equation (25 %)

1. Find the family of the curve such that the projection on the x -axis of the part of the tangent between (x, y) and the x axis has length 1. (5%)
2. A 6 lb. weight is attached to the lower end of a spring suspended from the ceiling, the spring constant being 27 lb/ft. The weight comes to rest, and beginning at $t = 0$ an external force given by $F(t) = 12 \cos 20t$ is applied to the system. Determine the resulting displacement as a function of time, assuming damping is negligible. (10%)
3. How many methods can you use to solve the differential equation

$$2xydx + (y^2 - x^2)dy = 0$$

Explain your answers. (10%)

參考用

Linear Algebra & Vector Calculus (25 %)

4. Show that the differential form under the integral sign of

$$I = \int_{(-1,5)}^{(4,3)} (3z^2 dx + 6xzdz)$$

is exact, so that we have independence of path in any domain, and find the value of the integral I from A: (-1, 5) to B: (4, 3). (10%)

5. Find out what type of conic section is represented by the given quadratic form.

$$Q = 17 x_1^2 - 30 x_1 x_2 + 17 x_2^2 = 128. \text{ Transform it to principal axes. (15\%)}$$

注意：背面有試題

國立中央大學97學年度碩士班考試入學試題卷

所別：機械工程學系碩士班 丁組(系統) 科目：工程數學(含程式設計) 共 2 頁 第 2 頁
光機電工程研究所碩士班 甲組 工程數學及程式設計 *請在試卷答案卷(卡)內作答

Complex Analysis (25 %)

6. Determine where the function, $f(z) = 2x - x^3 - xy^2 + i(x^2 + y^3 - 2y)$, is analytic. (10%)

7. Evaluate the following integral counterclockwise. (15%)

$$\oint_C \cot \frac{z}{4} dz, \quad C: |z|=1.$$

程式語言 (25 %)

以下問題可使用 VB、C、C++或 Fortran 之其中一種的程式語法回達，並註明所使用的程式語言。

8. 請解釋下列各對名詞並簡述其差異: (a) 字元與字串、(b) 符點單精度實數與符點雙精度實數、(c) 比較運算子"="與邏輯運算子"=="。(6%)
9. 有一二維陣列 A，其元素個數為 mxn，每一元素之值均為 1，請使用 for 迴圈將數值 1 指定到 A 內所有元素中。(9%)
10. 假設有一函數 x=die()可產生 1 至 6 之任意整數，以 for 迴圈執行此一函數十次，並將每次出現的數值加總，最後判斷總合為奇數或偶數，若為奇數，則令 y=1，否則令 y=0。請寫出此一程式碼。(10%)

注意：背面有試題