1、【常微分方程式】15%

Evaluate a general solution for the following second-order differential equation

$$y''-2y'+y = x^{\frac{3}{2}}e^x$$

2、【常微分方程式】15%

Solve the initial value problem in second-order differential equation

$$(D^2 + 2D + 10)y = 10x^2 + 4x + 2, \quad y(0) = 1, \quad y'(0) = -1$$

3、【向量分析】15%

Evaluate the line integral $\int_C \mathbf{F} \bullet \mathbf{r}'(s)ds$ by Stokes Theorem for the following C and $\mathbf{F}$ functions

$$\mathbf{F} = [y^3, -x^3, 0], \quad C \text{ the boundary on circular disk, } x^2 + y^2 \le 1, \quad z = 0$$

4、【拉普拉氏轉換】15%

Solve the following initial value problem by the Laplace transform:

$$y'' - 5y' + 6y = r(t), \quad \text{where} \quad r(t) = 4e^t, \quad \text{for } 0 < t < 2 \quad \text{and } r(t) = 0 \quad \text{for } t > 2;$$

under initial conditions $y(0) = 1$ and $y'(0) = -2$.

5、【偏微分方程式】【Small Amplitude Wave Theory】40%

For one-dimensional water wave propagation in an incompressible and inviscid fluid of uniform depth h, irrotationality of the fluid motion has been assumed. Derive an expression for the velocity potential function ϕ that satisfies Laplace's equation

$$\frac{\partial^2 \phi}{\partial x^2} + \frac{\partial^2 \phi}{\partial z^2} = 0, \quad -h < z < 0$$

The wave motion bounded between a free surface $\eta(x, t)$ and the horizontal bottom has to satisfy the following linearized boundary conditions:

$$\text{KFSBC}: \quad \frac{\partial \eta}{\partial t} - \frac{\partial \phi}{\partial z} = 0, \quad z = \eta$$

$$\text{DFSBC}: \quad \frac{\partial \phi}{\partial t} + g\eta = 0, \quad z = \eta$$

$$\text{BBC}: \quad \frac{\partial \phi}{\partial z} = 0, \quad z = -h$$

1. What are the basic methodologies for describing the fluid motion and based on these methodologies please derive the three equations of conservation for the fluids. (50%)

2. Accident of collision between the ship and structures are common in the harbor. What would you do to avoid this happening? (25%)

3. After the incidence at 龍坑(事件), which damaged the bio-ecology seriously and also affected the management system related to many institutes largely (because the navigation matters of that area is the responsibility of Kaohsiung Harbor), according to your experience on the harbor engineering please indicate your opinion on this matter. (25%)

一、何謂生態工程(ecological engineering)？生態技術
　　(ecotechnology)？生態工法(ecological engineering
　　methods)？試舉例詳細說明生態工程之分類及其在我
　　國之應用情況。(50%)

二、我國近年來經常發生缺水的危機(旱災)及洪水的災害
　　(水災)，試分析究竟是何原因？我國針對此一環境問題
　　提出什麼樣的對策應對之？你認為其成效如何？你又
　　有何建議？(25%)

三、近來嚴重急性呼吸道併發症(SARS)盛行，對人類社會造
　　成極大的危害性。試從環境生態的觀點論述 SARS 病毒
　　危害人類之起因。而人類醫療科技的無論再怎麼發達進
　　步，為何仍無法阻擋此一令全世界人類恐慌的疾病？問
　　題究竟出在那裏？我們未來將又該如何應付這些怪異的
　　疾病呢？(25%)

1. 請討論海洋環境分析與一般水體的環境分析有何不同。 (10%)

2. 何謂 pzc (point of zero charge or zero of point charge)？對於 pzc 為 3 的顆粒在自然水體中帶正電或負電？如何決定？ (10%)

3. 某一沉積物隨深度有 FeS 與 $CaCO_3$ 交替成層，如年輪般，請說明其成因與沉積環境。 (5%)

4. 哪些因素會影響 BOD 試驗的生化氧化速率？ (5%)

5. 何謂 electric double layer？請以 counter-ion 與 co-ion 的濃度對距帶電表面的距離作圖說明。(10%)

6. 請分別解釋 CEC (cation-exchange capacity)、ECS(exchangeable cation status)與 TCLP (toxicity characteristic leaching procedure)。港內沉積物濬渫後海拋，請分別探討進行海拋海域附近沉積物樣品之 CEC、ECS 與 TCLP 的分析有無意義？ (15%)

7. 請討論環境荷爾蒙的定義及其對於環境生態的影響, 並請舉二個最具代表性的例子 (10%)

8. 請分別說明 Ion exchange，Electrodialysis 與 Reverse osmosis 在水處理上的應用與處理機制。(10%)

9. 解釋名詞 (15%)

   (1) alkalinity (2) chelating agent（3）The Nernst Equation

10. 請解釋 CFCs(chlorofluorocarbons)在工業界的應用與優點，CFCs 對環境有何傷害？是因它的何種特性造成 (10%)

92 年中山大學海洋環境及工程研究所博士班地理資訊系統考題

(92/6/7)

1. 地理(或空間)資料除了具備有 2D 或 3D 位置之特性外，亦同時具有時間之特性，試舉例實例說明具有時間特性之地理現象，並說明如何建立一個 temporal GIS。 (25 分)

2. 海洋資料不但具有三維、動態及模糊特性，且所蒐集之資料多為點形式，而氣象站之資料亦常呈現點狀分佈。在 GIS 中有一功能為 Thiessen Polygon，請說明何謂 Thiessen Polygon？如何形成？並舉出其可能應用之例子。 (25 分)

3. 何謂 metadata？試敘述如何建立之？並說明其與網路資料分享之關係為何？ (25 分)

4. 海洋資料常同時具有向量(vector)及網格(raster)資料，請說明向量及網格資料模式(model)之差異？並說明海岸及海洋 GIS 中可能有哪些向量及網格資料？如何整合之？ (25 分)

科目：海洋與海岸管理【海工系丙組】　　　　　　　　　　　共 / 頁 第 / 頁

一、 船舶溢油污染（Oil Spill）可能造成哪些影響？請舉國內或國外任一個油污染實例，說明應有的防治策略、應用技術和必要考慮？（25%）

二、 我國海岸管理現況如何？主要的相關機關與執掌各為何？你認為將來海岸地區應該由哪一機關管理，為什麼？如果將來要制訂「海岸法」，應該包含哪些內涵？（25%）

三、 何謂「私人部門（Private Sector）」，私人部門有哪些功能，你認為海洋與海岸事務，私人部門可以發揮何種角色？請以實例解說。（25%）

四、 台灣發展海域觀光遊憩的潛力或隱憂如何？有哪些法規或體制上的問題必須解決？什麼是「生態旅遊（Eco-tourism）」，有哪些較重要的原則？（25%）

1. (20%) What's your viewpoint of a "SYSTEM"? Please describe the characteristic of the system that your master thesis's research was trying to deal with.

2. (20%) Searching techniques are widely used in a variety of domains, such as optimization, artificial intelligent, statistical analysis, and the latest data mining. Please report briefly four specific searching approaches that have been developed.

3. (20%) In order to provide decision support information regarding the status of a system, usually measurement of an index is considered appropriate. For example, the PSI (Pollutant Standards Index) is used to evaluate the air quality in a region, and a land suitability index is to tell if an area is suitable for some land development. The formulation of such index is through certain systematic approaches based on raw data or domain experts. Please show what will you do if you are asked to generate an index under the situation that (a) plenty of raw data is available, **or** (b) only some domain experts are available.

4. (20%) System simulation is a powerful technique for stochastic problems. How do you formulate a discrete event simulation model?

5. (20%) State extensively how would you apply quantitative methods for management to the study of marine environmental management?

1. 試述研究統計學之方法及主要的目的；統計學與一般數學有何異同？(20%)

2. The air pollution in a city is caused mainly by industrial and automobile exhausts. In the next 5 years, the chances of successfully controlling these two sources of pollution are, respectively, 75% and 60%. Assume that if only one of the two sources is successfully controlled, the probability of bring the pollution below acceptable level would be 80%.
   (a) What is the probability of successfully controlling air pollution in the next 5 years?
   (b) If, in the next 5 years, the pollution level is not successfully controlled, what is the probability that it is entirely caused by the failure to control automobile exhaust?
   (c) If pollution is not controlled, what is the probability that control of automobile exhaust was not successful? (20%)

3. The street width at a school crosswalk is D ft, and a child crossing the street walks at a speed of 3.5 ft/sec. In other words, it takes a child $t = D/3.5$ sec to cross the street.
   Suppose 60 free intervals (t seconds each) in an hour, on the average, are desired at this crossing; how much average traffic volume can be allowed at this crosswalk before crossing controls will be necessary? Assume that cars crossing the crosswalk constitute a Poisson process. (20%)

4. (a) Assuming normality and know variance $\sigma^2 = 4$, test the hypothesis $\mu = 15.0$ against the alternative (a) $\mu = 12.0$, (b) $\mu = 15.8$, using a sample of size 10 with mean $\bar{x} = 14$ and choosing $\alpha = 5\%$.
   (b) How does the result in Prob. 6 change if we use a large sample, say, of size 100, the other data ($\bar{x} = 14$, $\alpha = 5\%$, etc.) remaining as before?
   (c) Determine the power of the test. (20%)

5. If in some week the numbers of customers in a bank from Monday to Friday were 2680, 1600, 2020, 2250, 3650.
   (a) Can we assert on the 1% level that the random variable X = Number of customers per day has the same probability (0.2) for each weekday?
   (b) Repeat the test for the more reasonable model that the five probabilities are 0.22, 0.14, 0.16, 0.18, 0.30, respectively, choosing $\alpha = 1\%$. (20%)

1、在理想風系作用下，太平洋遠離海岸地區的風漂流為何？劃出各緯度的風漂
　　流的力平衡圖。（30%）

2、何謂聖嬰現象？當它發生時，臨近的海岸地區的氣候有何改變？（30%）

3、論述海洋裏有那些非生物能源。（20%）

4、典型的海底地形為何？（20%）