

# 國立中山大學 96 學年度碩士班招生考試試題

科目：流體力學【海工系碩士班甲組選考】

共 2 頁 第 1 頁

25% 1. Explain the following terms:

- (1) Irrotational flow
- (2) kinematic viscosity
- (3) Circulation
- (4) Boiling
- (5) Continuum
- (6) Vena contracta
- (7) Cavitation
- (8) External forces

15% 2. The pressure difference,  $\Delta P$ , across a partial blockage in an artery (動脈) (called a stenosis (心肌梗塞)) is approximated by the equation

$$\Delta p = K_v \frac{\mu V}{D} + K_\mu \left( \frac{A_0}{A_1} - 1 \right)^2 \rho V^2$$

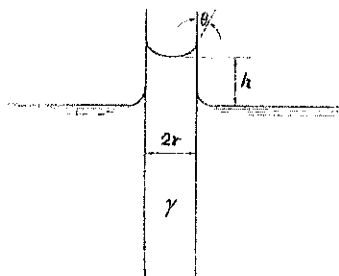
Where  $V$  is the blood velocity,  $D$  the artery diameter,  $\rho$  the blood density,  $\mu$  the blood viscosity,  $A_0$  the area of the unobstructed artery, and  $A_1$  the area of stenosis.

Determine the dimensions of the constants  $K_v$  and  $K_\mu$ . Would this equation be valid in any system of units?

15% 3. Prove the equation of capillary effect (毛細效應) for a small tube inserted into a water.

$$h = \frac{2\sigma \cos \theta}{\gamma r}$$

where  $h$  is the height of water,  $\sigma$  the surface tension,  $\theta$  the contact angle,  $\gamma$  the specific weight, and  $r$  the radius of tube.

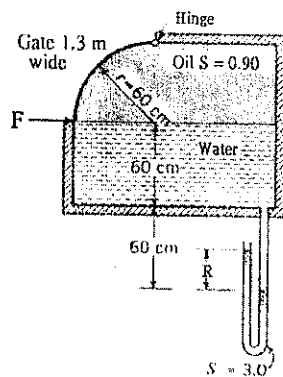


# 國立中山大學 96 學年度碩士班招生考試試題

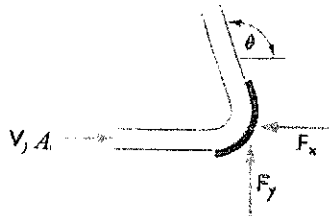
科目：流體力學【海工系碩士班甲組選考】

共 2 頁 第 2 頁

- 15% 4. Calculate the force  $F$  required to hold the gate of the figure as below in the closed position,  $R = 60$  cm.



- 15% 5. The forces  $F_x$  and  $F_y$  of figure are such that their magnitudes are related by  $F_x = 3F_y$ . Determine the angle through which the vane turns the fluid jet.



- 15% 6. The radial velocity component in an incompressible, two-dimensional flow field is

$$v_r = 2r + 3r^2 \sin \theta$$

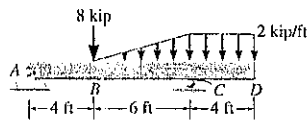
Determine the corresponding tangential velocity component,  $V_\theta$ , required to satisfy conservation of mass.

# 國立中山大學 96 學年度碩士班招生考試試題

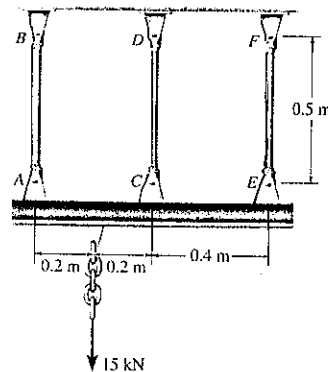
科目：工程力學【海工系碩士班甲組選考】

共 / 頁 第 / 頁

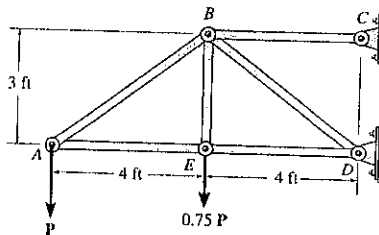
1. Please answer the following terms: (25%)
  - (1) Prismatic bar
  - (2) Pure torsion
  - (3) Simply support beam
  - (4) Perfect plastic material
  - (5) Saint Venant principle
  
2. Please draw the shear and moment diagrams for the overhanging beam shown in Fig. P2. (25%)
  
3. The three A-36 steel bars shown in Fig. P3 are pin connected to a rigid member. If the applied load on the member is 15 kN, please determine the force developed in each bar. Bars AB and EF each has a cross-sectional area of  $25 \text{ mm}^2$  and bar CF has a cross-sectional area of  $15 \text{ mm}^2$ . (25%)
  
4. The bars of the truss (shown in Fig. P4) each have a cross-sectional area of  $1.25 \text{ in}^2$ . If the maximum average normal stress in any bar is not to exceed 20 ksi, please determine the maximum magnitude P of the loads that can be applied to the truss. (25%)



P2



P3



P4

# 國立中山大學 96 學年度碩士班招生考試試題

科目：工程數學【海工系碩士班甲組】

共 / 頁 第 / 頁

- (1) **【Ordinary Differential Equations】** (24%)
- (a) Find the general solution of  $y'(\sinh 3y - 2xy) = y^2$ . (8%)
  - (b) Solve  $y'' + 2y' + 2y = 4e^{-x} \sec^3 x$ . (8%)
  - (c) Solve  $xy'' + (1-x)y' + ny = 0$  by Laplace Transformation, where  $n$  is a non-negative integer. (8%)
- (2) **【Linear Algebra】** (10%)
- Reduce  $2x_1^2 + 12x_1x_2 - 7x_2^2 = 10$  to principal axes, and express  $[x_1 \ x_2]^T$  in terms of new variables. (10%)
- (3) **【Vector Calculus】** (16%)
- (a) Given  $f = xy - yz$ ,  $\mathbf{v} = [2y, 2z, 4x + z]$ ,  $\mathbf{w} = [3z^2, 2x^2 - y^2, y^2]$ , find  $D_{\mathbf{v}}f$  (directional derivative of  $f$  in the direction of  $\mathbf{v}$ ) at  $(2, 3, 1)$  and  $[(\text{curl } \mathbf{v}) \times \mathbf{w}] \cdot \mathbf{w}$ . (8%)
  - (b) Find the work done by a force  $\mathbf{F} = [x^2, y^2, y^2x]$  along the curve  $C$ : the helix  $\mathbf{r} = [\cos t, \sin t, 3t]$ ,  $0 \leq t \leq \pi/2$ . (8%)
- (4) **【Partial Differentiation Equations】** (24%)
- Linear partial differential equations,  $Au_{xx} + 2Bu_{xy} + Cu_{yy} = F(x, y, u, u_x, u_y)$  can be classified into one of the three types: elliptic, parabolic or hyperbolic, depending on the condition of  $B^2 - 4AC$ .
- (a) Indicate how the condition of  $B^2 - 4AC$  is linked to each of these three types and also provide a typical mathematical equation for each of them. (15%)
  - (b) Prove  $u = 2xy/(x^2 + y^2)^2$  is a solution to the Laplace equation. (9%)
- (5) **【Fourier Analysis】** (10%)
- Find the Fourier series for  $f(x) = x$  within the range of  $0 < x < 2\pi$ . (10%)
- (6) **【Solution by Laplace Transform and Undetermined Coefficients】** (16%)
- Solve the following linear differential equation  $y'' + 2y' + y = e^{-t}$ , by
- (a) Laplace transform for initial conditions  $y(0) = -1$  and  $y'(0) = 1$ . and (8%)
  - (b) Solution of undetermined coefficients for initial conditions  $y(0) = -1$  and  $y'(0) = 1$ . (8%)

# 國立中山大學 96 學年度碩士班招生考試試題

科目：基礎環境科學【海工系碩士班乙組】

共 / 頁 第 / 頁

## 一、解釋名詞：(40%)

1. environmental science
2. natural capital
3. environmentally sustainable society
4. per capita ecological footprint
5. biodiversity
6. biomass energy
7. ecological niche
8. secondary air pollutants
9. global climate change
10. constructed wetlands and created wetlands

## 二、問答題：(60%)

1. Please, describe the two principles to achieve long-term sustainability for ecosystems. (12%)
2. What is genetic engineering? How is this biotechnology applied in human society? What is your opinion about this application? Good or bad to our ecosystem and environment? (12%)
3. What will be the impact to environment for globalization(全球化)? (12%)
4. Both of the issues of too much water and less water will bring impact to human society and other organisms. How do we reduce flood risks by using ecotechnology? How do we sustain our water resources? (12%)
5. How do we prevent and reduce surface water and groundwater pollution? (12%)

# 國立中山大學 96 學年度碩士班招生考試試題

科目：環境微生物學與環境化學【海工系碩士班乙組】

共 1 頁 第 1 頁

1. 試述環境微生物與飲用水安全議題的相關性。(10%)
2. 試述環境微生物與污染物處理議題的相關性。(10%)
3. 試述環境微生物與製造再生能源(renewable energy)與清潔能源(clean energy)間的相關性。(10%)
4. 試述水中溶氧檢測的基本原理，採樣與保存樣品時應注意事項。(10%)
5. 試述在一個層化(stratified)嚴重的湖泊，pE 值、溶氧值與溫度的垂直分佈與原因(10%)
6. 解釋名詞：(1)鹼度(alkalinity) (2) 電雙層(electric double layer) (3) 環境荷爾蒙 (4) breakpoint chlorination (20%)
7. BOD 反應動力學假設為一階動力反應，「一階動力反應」是什麼意思？哪些因素會影響 BOD 試驗之生化氧化速率 (6%)
8. 試舉出兩個化學程序以去除水中重金屬 (請說明去除原理)。(6%)
9. 請列式子說明如何解出將 0.001mole  $\text{NaHCO}_3$  加到一公升水中之平衡 pH 值。(pK<sub>a1</sub>=5; pK<sub>a2</sub>=9) (6%)
10. Calculate pE values for an acid solution  $10^{-5}$  M in  $\text{Fe}^{+3}$  and  $10^{-3}$  M in  $\text{Fe}^{+2}$   
given:  $\text{Fe}^{+3} + e^- = \text{Fe}^{+2}$  pE<sup>0</sup> = 16 (6%)
11. Please discuss the mechanism of formation of limestone caves, including the role of microbial in this process. (6%)

# 國立中山大學 96 學年度碩士班招生考試試題

科目：環境保護概論【海工系碩士班丙組選考】

共 / 頁 第 / 頁

1. 目前世界上的石油存量逐年減少，試問我國對於替代能源政策的發展為何？已有那些措施已經上路？除此之外，你認為還有那些替代方式可以減少對化石燃料(fossil fuels)的依賴，又可減低對環境的危害？(25%)
2. 今年美國奧斯卡最佳紀錄得獎片為「不願面對的真相」，請問此片所提及有關環境的議題為何？當今人類社會該如何去做才能解決此依環境問題？(25%)
3. 台灣極限馬拉松選手林義傑完成跑步橫越撒哈拉沙漠的壯舉，成為最先成功完成這項 6437 公里艱苦路程的現代跑者。其中最讓林先生感受最深的為居住在撒哈拉沙漠的民族對於水資源缺乏所面臨的困境，對水資源格外的珍惜。試問我們應如何做才能永續地球的水資源？(25%)
4. 近幾年來我國接二連三在我國臨近岸邊的海域發生了一些貨輪或化學輪擱淺漏油的意外事件，其中包括「阿瑪斯號事件」、「三合兄弟號事件」及「吉尼號事件」等。這些意外事件皆發生在我國公布「海洋污染防治法」之後，試問我國對於這些事件的處置措施分別為何？你認為妥不妥當，還有那些地方需要改進？(25%)

# 國立中山大學 96 學年度碩士班招生考試試題

科目：計算機概論【海工系碩士班丙組選考】

共 2 頁 第 1 頁

1. 請說明下列段落所談之內容，並說明 data warehouse 特性及舉例說明其可能之應用。(20分)

A data warehouse is the main repository of the organization's historical data, its corporate memory. For example, an organization would use the information that's stored in its data warehouse to find out what day of the week they sold the most widgets in May 1992, or how employee sick leave the week before Christmas differed between California and Quebec from 2001-2005. In other words, the data warehouse contains the raw material for management's decision support system. The critical factor leading to the use of a data warehouse is that a data analyst can perform complex queries and analysis (such as data mining) on the information without slowing down the operational systems.

While operational systems are optimized for simplicity and speed of modification (online transaction processing, or *OLTP*) through heavy use of database normalization and an entity-relationship model, the data warehouse is optimized for reporting and analysis (online analytical processing, or *OLAP*). Frequently data in data warehouses is heavily denormalised, summarised and/or stored in a dimension-based model but this is not always required to achieve acceptable query response times.

More formally, Bill Inmon (one of the earliest and most influential practitioners) defined a data warehouse as follows:

- **Subject-oriented**, meaning that the data in the database is organized so that all the data elements relating to the same real-world event or object are linked together;
- **Time-variant**, meaning that the changes to the data in the database are tracked and recorded so that reports can be produced showing changes over time;
- **Non-volatile**, meaning that data in the database is never over-written or deleted, once committed, the data is static, read-only, but retained for future reporting;
- **Integrated**, meaning that the database contains data from most or all of an organization's operational applications, and that this data is made consistent.

As technology improved (lower cost for more performance) and user requirements increased (faster data load cycle times and more features), data warehouses have evolved through several fundamental stages:

- **Offline Operational Databases** - Data warehouses in this initial stage are developed by simply copying the database of an operational system to an off-line server where the processing load of reporting does not impact on the operational system's performance.
- **Offline Data Warehouse** - Data warehouses in this stage of evolution are updated on a regular time cycle (usually daily, weekly or monthly) from the operational systems and the data is stored in an integrated reporting-oriented data structure
- **Real Time Data Warehouse** - Data warehouses at this stage are updated on a transaction or event basis, every time an operational system performs a transaction (e.g. an order or a delivery or a booking etc.)
- **Integrated Data Warehouse** - Data warehouses at this stage are used to generate activity or transactions that are passed back into the operational systems for use in the daily activity of the organization.

2. 請說明下列段落所談之內容，並說明 data mining 與統計學之關係，且舉例說明其可能之應用。(20分)

Data mining has been defined as "the nontrivial extraction of implicit, previously unknown, and potentially useful information from data" and "the science of extracting useful



# 國立中山大學 96 學年度碩士班招生考試試題

科目：計算機概論【海工系碩士班丙組選考】

共 2 頁 第 2 頁

information from large data sets or databases". It involves sorting through large amounts of data and picking out relevant information. It is usually used by businesses and other organizations, but is increasingly used in the sciences to extract information from the enormous data sets generated by modern experimentation.

Metadata, or data about a given data set, are often expressed in a condensed *data mine-able* format, or one that facilitates the practice of data mining. Common examples include executive summaries and scientific abstracts.

Although data mining is a relatively new term, the technology is not. Companies for a long time have used powerful computers to sift through volumes of data such as supermarket scanner data, and produce market research reports. Continuous innovations in computer processing power, disk storage, and statistical software are dramatically increasing the accuracy and usefulness of analysis. Data mining identifies trends within data that go beyond simple analysis. Through the use of sophisticated algorithms, users have the ability to identify key attributes of business processes and target opportunities.

The term data mining is often used to apply to the two separate processes of knowledge discovery and prediction. Knowledge discovery provides explicit information that has a readable form and can be understood by a user. Forecasting, or predictive modeling provides predictions of future events and may be transparent and readable in some approaches (e.g. rule based systems) and opaque in others such as neural networks. Moreover, some data mining systems such as neural networks are inherently geared towards prediction rather than knowledge discovery.

3. (a) 何謂主從式(client/server)及對等式網路架構(Peer-to-Peer) (10 分)

(b) 何謂 SRAM 與 DRAM? 並請比較其間之差異? (10 分)

4. (a) 何謂知識經濟? 並請說明其與電腦之關係? (10 分)

(b) 何謂決策支援系統(Decision Support System, DSS)? 何謂專家系統(Expert System, ES)? (10 分)

5. 若有一個檔案包含十個實數(real number), 且以空格分隔各個實數, 請以 Fortran、Basic 或 C 等程式語言, 寫下一個程式(program)來讀出所有實數, 並加以排序(sorting)後, 再輸出至另一個檔案。 (20 分)

# 國立中山大學 96 學年度碩士班招生考試試題

科目：線性代數【海工系碩士班丙組選考】

共 1 頁 第 1 頁

1. (20%) Given a linear system 
$$\begin{cases} 2x_1 + 2x_2 - 4x_3 = 14 \\ 3x_1 + x_2 + x_3 = 8 \\ 2x_1 - x_2 + 2x_3 = -1 \end{cases}$$
, answer the following questions.

- (a) (10%) Without really solving the problem, do you know if the linear system has a solution? And if the linear system has solution(s), what type of solution will it be (unique or infinitely many)? (No point will be given without detailed description)
- (b) (10%) Solve the linear system by Gauss Elimination and Cramer's Rule.

2. (20%) Construct a model of population flows between city, suburban, and non-metropolitan areas. Their respective populations in 2000 are 58 million, 142 million, and 60 million. The stochastic matrix given the probabilities of the move for each year is as the following table.

			(from)				(to)
city	suburb	non-metro				city	
0.96	0.01	0.015				city	
0.03	0.98	0.005				suburb	
0.01	0.01	0.98				non-metro.	

- (a) (10%) Predict the populations of city, suburban, and non-metropolitan areas for 2001 and 2002.
- (b) (5%) If a person is living in the city in 2000, what is the probability that the person will be living in a non-metropolitan area in 2002?
- (c) (5%) Describe (you don't have to compute) how to find the steady-state populations?
3. (15%) Show that the set  $\{(1, 0, -1), (1, 1, 1), (1, 2, 4)\}$  is a basis for  $\mathbf{R}^3$
4. (10%) Matrices  $\mathbf{A}$  and  $\mathbf{B}$  are said to be orthogonally similar if there exists an orthogonal matrix  $\mathbf{C}$  such that  $\mathbf{B} = \mathbf{C}^{-1}\mathbf{A}\mathbf{C}$ . Show that if  $\mathbf{A}$  is symmetric and  $\mathbf{A}$  and  $\mathbf{B}$  are orthogonally similar, then  $\mathbf{B}$  is also symmetric.

5. (15%) Find a basis of eigenvectors and diagonalize the matrix 
$$\begin{bmatrix} 7.3 & 0.2 & -3.7 \\ -11.5 & 1.0 & 5.5 \\ 17.7 & 1.8 & -9.3 \end{bmatrix}$$

6. (20%) Show the characteristics of eigenvalues for the following special matrices.
- (a) (10%) The eigenvalues of a *Hermitian* matrix are real.
- (b) (5%) The eigenvalues of a *skew-Hermitian* matrix are pure imaginary or zero.
- (c) (5%) The eigenvalues of a *unitary* matrix have absolute value 1.

# 國立中山大學 96 學年度碩士班招生考試試題

科目：統計學【海工系碩士班丙組選考】

共 2 頁 第 / 頁

## 第一部份：數學公式/簡要說明題【60分】

### 1. 【Normal distribution】【20分】

A large samples of physical parameters  $x_i$  ( $i = 1$  to  $N$ ) may produce a normal distribution  $N(\bar{x}, s)$ , where  $\bar{x}$  is the mean and  $s$  is the standard deviation of the samples.

- (1) Indicate the position of the *mean*, *median* and *mode* on a biased distribution curve.
- (2) If the population mean is given by  $\mu$  and sample mean by  $\bar{x}$ , express mathematically the variance of the population  $\sigma^2$  and a small sample set  $s^2$ , respectively.
- (3) How to normalize (standardize) the quantity  $x_i$  in order to calculate the accumulated probability using a  $N$ -distribution table?
- (4) Give a general equation for the probability density function  $p(x)$  of a normal distribution  $N(\bar{x}, s)$ .
- (5) Upon using the  $z$ -score to standardize each sample value, the standardized normal distribution  $N(0, 1)$  has zero mean about  $\sigma = 0$ . What is the accumulated probability within the range of  $-2\sigma \leq z_i \leq +2\sigma$  and  $-3\sigma \leq z_i \leq +3\sigma$ , respectively?

### 2. 【Definition of ANOVA】【5分】

What are the complete words for the abbreviated ANOVA?

### 3. 【Definition of statistical tests】【15分】

Give the mathematical equation and the main purpose of its applications for each of the following three major statistical tests, namely (1)  $t$ -test, (2)  $F$ -test and (3)  $\chi^2$ -test.

### 4. 【Covariance and correlation coefficient】【10分】

From two data sets  $x_i$  and  $y_i$ ,  $i = 1$  to  $N$ :

- (1) Define the *covariance*  $C_{xy}$  in words and express it in a mathematical form.
- (2) Define the *correlation coefficient*  $\rho_{xy}$  in words and express it in a mathematical form.

### 5. 【Classification of deterministic data】【10分】

Deterministic data are scientific data of a physical parameter (such as wind velocity, temperature etc) as a function of time.

- (1) Give a broad classification of deterministic data.
- (2) What is the main purpose of applying *Fourier Transform* on a time series data?

## 第二部份：計算題【40分】

### 6. 【Interval of estimation】【10分】

Suppose we have six random samples of the weights for new-born baby taken in a private hospital, these being 3.2, 2.9, 3.4, 4.0, 3.4 and 3.8 kilograms, respectively.

- (1) Calculate a 95% confidence interval for the estimation of the mean weight of new-born baby.
- (2) Given the standard deviation of new-born baby weight as 0.4, find the mean weight for a 90% confidence interval. 【Use  $t$ -distribution】

# 國立中山大學 96 學年度碩士班招生考試試題

科目：統計學【海工系碩士班丙組選考】

共 2 頁 第 2 頁

**7. 【Test of hypothesis and  $\chi^2$ -distribution】【10 分】**

A factory claims that one of its products would last 3 years. Random samples taken from 10 consumers indicate this product had lasted [3.5, 3.1, 3.4, 3.7, 3.2, 3.8, 2.9, 3.2, 3.1, 3.2] years, respectively. Given the standard deviation of the years of usage is 0.2, and for a 95% confidence interval, test whether the claim given by this factory is true? 【Set up hypothesis  $H_0$  and  $H_1$  and Use  $\chi^2$ -table】

**8. 【Regression analysis and curve fitting】【20 分】**

Given a field data set of wind velocity versus height above a reference ground level as:

Height above ground $x$ (m):	0	5	10	15	20	25	30
Wind velocity $y$ (m/sec):	0.0	2.2	3.5	4.1	4.6	5.0	5.1

- (1) Derive mathematical expression for coefficients  $b_1$  and  $b_2$  in the linear equation  $y_i = b_1 x_i + b_2$ , where  $y_i$  is the estimated value for each  $x_i$ .
- (2) Calculate the values of  $b_1$  and  $b_2$  using the wind data given above.

**TABLE** Critical Values of  $t$  for  $\nu$  Degrees of Freedom and Selected Levels of Significance

Number of Degrees of Freedom, $\nu$	Significance Level, $\alpha$ (%)					
	10	5	2.5	1	0.5	0.1
1	3.078	6.314	12.706	31.821	63.657	318.310
2	1.886	2.920	4.303	6.965	9.925	22.327
3	1.638	2.353	3.182	4.541	5.841	10.215
4	1.533	2.132	2.776	3.747	4.604	7.173
5	1.476	2.015	2.571	3.365	4.032	5.893
6	1.440	1.943	2.447	3.143	3.707	5.208
7	1.415	1.895	2.365	2.998	3.499	4.785
8	1.397	1.860	2.306	2.896	3.355	4.501
9	1.383	1.833	2.262	2.821	3.250	4.297
10	1.372	1.812	2.228	2.764	3.169	4.144

**TABLE** Critical Values of  $\chi^2$  for  $\nu$  Degrees of Freedom and Selected Levels of Significance

Number of Degrees of Freedom, $\nu$	Significance Level, $\alpha$ (%)				
	20	10	5	2.5	1
1	1.64	2.71	3.84	5.02	6.63
2	3.22	4.61	5.99	7.38	9.21
3	4.64	6.25	7.81	9.35	11.34
4	5.99	7.78	9.49	11.14	13.28
5	7.29	9.24	11.07	12.83	15.09
6	8.56	10.64	12.59	14.45	16.81
7	9.80	12.02	14.07	16.01	18.48
8	11.03	13.36	15.51	17.53	20.09
9	12.24	14.68	16.92	19.02	21.67
10	13.44	15.99	18.31	20.48	23.21
11	14.63	17.28	19.68	21.92	24.72
12	15.81	18.55	21.03	23.34	26.22
13	16.99	19.81	22.36	24.74	27.69
14	18.15	21.06	23.68	26.12	29.14
15	19.31	22.31	25.00	27.49	30.58

# 國立中山大學 96 學年度碩士班招生考試試題

科目：微積分【海工系碩士班兩組選考】

共 / 頁第 / 頁

1. (20%) Find the first derivative for the following given functions with respect to  $x$ :

(a)  $f(x) = \frac{4+2x}{\sqrt{x^3}}$ ; (b)  $f(x) = x^2 e^{-x}$ ; (c)  $f(x) = 5x\sqrt{x^2+1}$ ; (d)  $x \ln y - y \ln x = 8$ .

2. (10%) Given (a)  $x^2 + y^2 = 3$ , find  $\frac{dy}{dx}$  and  $\frac{d^2y}{dx^2}$ ;

(b)  $z = ye^{2x} + x \ln y^2$ , find  $\frac{\partial z}{\partial x}$  and  $\frac{\partial^2 z}{\partial x \partial y}$ .

3. (5%) Find the limits for:

(a)  $\lim_{x \rightarrow 1} \frac{3x-3}{x^2-1}$ ; (b)  $\lim_{x \rightarrow 0} \frac{\sqrt{x}-1}{x-1}$ .

4. (5%) A circular cylindrical container is 20 cm high with 6 cm in inner diameter. Initially, the container is filled of water to its full height and is placed vertically. If a small hole is punctured at the bottom of the container and allows water to discharge by gravity. Estimate the rate of decrease in water surface level for the initial rate of discharge at  $12 \text{ cm}^3$  per second.

5. (10%) Find the relative extrema for function  $f(x) = 2x - 3x^{2/3}$ , using first and second order derivatives to assist the classification of either a maximum or minimum.

6. (40%) Find the integral for each of the given functions:

(a)  $\int \frac{dx}{x^{1/3} + x^{1/2}}$ .

(b)  $\int \frac{t+1}{t^{1/2}} dt$

(c)  $\int [\sin x \cdot \ln(2 + \cos x)] dx$ .

(d)  $\int \frac{e^{3x^2+4}}{x} dx$

7. (10%) Questions in power series:

(a) Test whether the series  $\sum_{n=0}^{\infty} \frac{n-i}{3n+2i}$  is in convergence or divergence.

(b) Find the Fourier series for  $f(x) = x$  within the range of  $0 < x < 2\pi$ .