



國立臺灣海洋大學一〇〇學年度研究所碩士班暨碩士在職專班入學考試試題

考試科目： 閱讀與評析

系所名稱： 商船學系碩士在職專班（不分組）

1.答案以橫式由左至右書寫。2.請依題號順序作答。

**Part 1 :**

**Please read the article and answer the following questions. (Q1-Q3). (10%)**

In this study, a real time maritime traffic support model is developed for safe navigation in the Strait of Istanbul, also known as the Bosphorus. The present model simulates vessel trajectories corresponding to possible headings, using channel geometry, counter traffic, and surface currents as input. A new MATLAB code is developed for the simulation and the Marine GNC Toolbox (Fossen and Perez, 2004) is used for the vessel hydrodynamics and the auto-pilot model. After computing the trajectory tree of the vessel by forward-mapping its position distribution with respect to the initial position vector, the casualty probabilities of each trajectory are found. Within certain restrictions on vessel geometry, the proposed model predicts the safest possible intended course for the transit vessels based on the navigational parameters including position, speed, and course of the vessel. The model is tested for the Strait of Istanbul for validation. Without loss of generality, the model can be used for any narrow channel with a vessel traffic system providing the necessary input.

(Excerpted from Yazici, M. A. (2009), "A Navigation Safety Support Model for the Strait of Istanbul", *The Journal of Navigation*, Vol. 42, pp. 609-630.)

- (1) What is the objective of the paper? (A) Development of new MATLAB software to analyze the traffic problems in the Strait of Istanbul (B) Development of a traffic support model to predict the safest possible intended courses for transit vessels in the Strait of Istanbul (C) Construction of a new model based on Marine GNC Toolbox to evaluate causes of the casualties taken place in the Strait of Istanbul (D) Modification of an existing model to predict the probability of occurrence of vessel accidents in the Strait of Istanbul (4%)
- (2) Which statement is **NOT** true? (A) The traffic support model developed simulates vessel tracks according with possible headings, considering the factors of channel geometry, counter traffic, and surface currents. (B) The framework proposed is applicable not only to the Strait of Istanbul but any other channels with sufficient

data. (C) This research is capable of enhancing navigation safety for vessels sailing in narrow waterways. (D) With little consideration of the confinement to ship geometry, the proposed model predicts the safest possible intended course for the transit vessels based on the navigational parameters including position, speed, and course of the vessel. (3%)

- (3) What is the meaning of “real time”? (A) the actual time during which a process or event occurs (B) the overall time elapsed by a process or event (C) the time spent by a specific segment of a process or event (D) the average time expended by a process or event. (3%)

**Part 2 :**

**Please read the article and answer the following questions. (Q4-Q7). (20%)**

**INTRODUCTION.** Navigational safety of a ship manoeuvring in restricted areas such as waterways, harbour entrances, harbour basins, turning basins and others, is most frequently assessed by quantitative analysis methods based on probabilistic methods. One typical approach in such cases utilises data from simulated passages conducted by navigators. From the data one can estimate parameters of the density distribution function of the random variable of the distance from waterway border. The use of the density function makes it possible to determine the probability that a ship will move outside safe boundaries of the waterway, in which case a ship may run aground or strike a port structure. Such an event results in the system state being changed to safety failure and a navigational accident. One shortcoming of the probabilistic method is that it is impossible to assess a situation when no accident occurs but safety is threatened, that is a situation when a ship is manoeuvring too close to the waterway boundary. From the safety point of view, if no or inadequate measures are undertaken, this state can result in navigational accident. This paper presents the practical application of two different methods to determine the probability of a dangerous situation for a ship manoeuvring in a waterway bend. The results have been compared and extensively discussed in view of their practical application.

**THE PROBABILISTIC METHOD TO ASSESS THE SAFETY OF SHIP MANOEUVRE IN A RESTRICTED AREA.** The probabilistic method to assess the safety of a manoeuvring ship consists in determining the probability of a collision of a ship in motion, understood as a ship's deviation outside a designated manoeuvring

area. Depending on the area shape, a collision may result in hitting a wharf, port structure or grounding on the bottom. The determination of collision probability is based on simulated or field studies consisting of a series of trials in which navigators handle a ship through a waterway. In the trials, the waterway in question is divided into sections defined by lines perpendicular to the waterway centre line (Gucma, 1999). The trials of reliable size, guaranteeing a preset level of confidence, are followed by the estimation of distribution parameters of the function density of random variable probability : maximum distance of ship's points to the starboard and port sides from the waterway centre line, separately for particular sections. Two random variables are determined in each of the sections: maximum distances of ship's extreme points to the starboard and port side from the waterway centre line. When the phenomenon model (type of distribution) is determined, its parameters are estimated.

**PROBABILITY OF A FUZZY EVENT.** The approach presented above does not account for dangerous situations in which a ship comes too close to the waterway boundary; as such situations may lead to situations of safety failure. This, for instance, refers to areas difficult for navigation in which, although not many accidents have occurred, dangerous situations are observed (Driankov, 1993; Gućma and Pietrzykowski, 2001). The probability of a fuzzy event refers to a situation when there co-exist uncertainties of fuzzy and probabilistic type. Such a case takes place when an attempt is made to determine a probability of a dangerous situation for a ship moving in a restricted area such as a waterway. A dangerous situation is meant to be a system state which, if no or inadequate countermeasures are taken, may change to the state of safety failure (navigational accident). In the connection with the above, the term 'dangerous navigational situation' denotes the state of the ship-area system that may, but does not have to, lead to a navigational accident. Such situations are referred to as incidents. As in most cases incidents do not end in a collision, i.e. accident, they are not registered or included in any statistics. The term 'dangerous situation' is an example of a linguistic variable described by the membership function of the fuzzy set 'dangerous situation', which roughly corresponds to the fuzzy set 'dangerous distance'. An event understood as an occurrence of such situation is an example of a fuzzy event. Hence the determination of the probability that a dangerous situation will occur comes down to the determination of a probability of a fuzzy event.

(Excerpted from Gućma, L. and Pietrzykowski, Z (2006), "Ship manoeuvring in restricted areas- An attempt to quantify dangerous situations using a probabilistic-fuzzy method", *The Journal of Navigation*, Vol. 59, pp. 251-262.)

- (4) According to the paper, under which circumstances may the probabilistic approach not be particularly applicable? (A) where a ship moves outside safe boundaries of the waterway (B) where a ship strands (C) where a ship navigates in a waterway bend (D) where a ship strikes port structures (5%)
- (5) Which statement is true? (A) The probability approach is incapable of evaluating the ship safety in each section of the confined waters. (B) The probability method is developed based on the construction of a ship manoeuvring area in a waterway outside which the accidental likelihood is assessed. (C) The probability approach considers the areas close to waterway banks. (D) The approach is proven to be effective in situations where the sample size of the collisions is small (5%)
- (6) What is the meaning of “incidents”? (A) a chain of events that definitely leads to an accident (B) a chain of events that might escalate to an disaster (C) a chain of events that seldom becomes an accident (D) a chain of events that prevent the situation from accidents (5%)
- (7) What is the objective of these three paragraphs? (A) Analysis of the shortcomings of the probability approach (B) Discussion of the strengths of the traditional study based on the probability approach (C) Discussion of the relationship between “incidents” and “accidents”(D) Necessity of developing a new model capable of conducting a thorough risk assessment for ships navigating in waterways (5%)

**Part 3 :**

**Please read the article.**

**The Tropical Rainforest**

The tropical rainforest is a forest of tall trees in a region of year-round warmth, with an average of 50 to 260 inches (125 to 660 cm) of yearly rainfall.

Rainforests belong to the tropical wet climate group. The temperature in a rainforest rarely gets higher than 93° F (34° C) or drops below 68° F (20° C); while the average humidity is between 77% and 88%. Generally, rainfall is often more than 100 inches a year. There is usually a brief season of less rain. In monsoon areas, there is rarely a

dry season. Almost all rainforests lie near the equator.

Rainforests now cover less 6% of the Earth's land surface. Scientists estimate that more than half of all the world's plant and animal species live in tropical rainforests and that they produce 40% of Earth's oxygen.

A tropical rainforest has more kinds of trees than any other area in the world. Scientists have counted about 100 to 300 species in a 2.5 acre (1-hectare) area in South America. Seventy percent of the plants in the rainforest are trees.

About 1/4 of all the medicines we use come from rainforest plants. Curare comes from a typical vine and is used as an anesthetic and to relax muscles during surgery. Quinine, from the cinchona tree, is used to treat malaria. A person with lymphocytic leukemia has a 99% chance that the disease will go into remission because of the rosy periwinkle. Altogether, more than 1,400 varieties of tropical plants are thought to be potential cures for cancer.

All tropical rainforests resemble one another in some ways. Many of the trees have straight trunks that do not branch out for 100 feet or more. There is no sense in growing braches below the canopy where there is little light. The majority of the trees have smooth and thin bark because there is no need to protect them from water loss and freezing temperatures. It also makes it difficult for epiphytes and plant parasites to get a hold on the trunks. The bark of different species is so similar that it is difficult to identify a tree by its bark. In fact, many trees can only be identified by their flowers.

Despite these differences, each of the three largest rainforests, the American, the African and the Asian, has a different group of animal and plant species. Each rainforest has many species of monkeys, all of which differ from the species of the other two rainforests. In addition, different areas of the same rainforest may have different species. For example, many kinds of trees that grow in the mountains of the Amazon rainforest do not grow in the lowlands of that same forest.

There are four very distinct layers of trees in a tropical rainforest. These layers have been identified as the emergent, upper canopy, understory and forest floor.

Emergent trees are spaced wide apart and are 100 to 200 feet tall with umbrella-shaped canopies that grow above the forest. Because emergent trees are

exposed to drying winds, they tend to have small and pointed leaves. Some species lose their leaves during the brief dry season in monsoon rainforests. These giant trees have straight and smooth trunks with few braches. Their root system is very shallow and to support their size they grow buttresses that can spread out to a distance of 30 feet.

The upper canopy of 60 to 130 foot tress allows light to be easily available at the top of this layer but greatly reduces any light below it. Most of the rainforest's animals live the upper canopy. There is so much food available at this level that some animals never go down to the forest floor. The leaves have "drop spouts" that allow rain to run off. This keeps them dry and prevents mold and mildew from forming in the humid environment.

The understory, or lower canopy, consists of 60 foot trees. This layer is made up of the trunks of canopy trees, shrubs, plants and small trees. There is little air movement. As a result the humidity is constantly high. This level is in constant shade.

The forest floor is usually completely shaded, except where a canopy tree has fallen and created an opening. Most areas of the forest floor receive so little light that few bushes or herbs can grow there. As a result, a person can easily walk through most parts of a tropical rainforest. Less than 1% of the light that strikes the top of the forest penetrates to the forest floor. The top soil is very thin and of poor quality. A lot of litter falls to the ground where it is quickly broken down by decomposers like termites, earthworms and fungi. The heat and humidity further help to break down the litter. This organic matter is then just as quickly absorbed by trees' shallow roots.

**Please read the following statements shown in the table and answer how they reflect the information in the reading passage by writing T, F or N/G. (Q8-Q12) (10%).**

|            |   |
|------------|---|
| <b>T</b>   | <b>If it accurately reflects the information given;</b>       |
| <b>F</b>   | <b>If it does not reflect the information;</b>                |
| <b>N/G</b> | <b>If the information is not clearly given in the passage</b> |

(8) Tropical rainforests contain the most kinds of trees. \_\_\_\_\_ (2%)

(9) Most of rainforest's animals live in the lower canopy. \_\_\_\_\_ (2%)

(10) Tropical rainforests are comprised of densely intertwined. \_\_\_\_\_  
(2%)

(11) Tropical rainforests supply about a quarter of the world's timber.  
\_\_\_\_\_ (2%)

(12) Hundreds of varieties of tropical plants are thought to be able to lengthen the human lifespan to over 100. \_\_\_\_\_ (2%)

**Part 4 :**

**Please read the article below and answer the following questions with words taken from the article. Also, please write NO MORE THAN THREE WORDS for each answer. (Q13-Q16) (10%).**

**Brief History of Immigration to Australia**

Early immigration to Australia can be divided into three main categories: convict, exploration and squatters, and the gold rush.

**Convict Immigration**

After spending many years researching workhouse immigration and eviction records from estates in Ireland and Australia, it appears that immigration to Australia was political, economic and class driven.

The European settlement of Australia began in 1788 with the establishment of a penal colony. Britain needed to relieve its overcrowded prisons, as the famine in Ireland and the Highland clearances of Scotland, as well as losing her American colonies all led to increase in its own penal population. Australia also provided a base for the Royal Navy in the eastern sea and was considered a possible entry point for economic opportunities.

On May 13<sup>th</sup>, 1787, Captain Arthur Phillip and the first Scotsman Captain John Hunter, commanding eleven ships full of convicts restrained in chains, left Britain for Australia, landing at Botany Bay on January 18, 1788. Over 150,000 other convicts were to follow, 8,207 being Scottish and mainly female. The ancestors of ten of thousands of today's Australians languished in rotting hulks, which were ships made

into prison cells. Some convicts never touched land and remained there until they died. The term of serving in these or the prisons was usually seven years, a substitute for execution.

On arrival, female convicts were sent directly to the female workhouse “factory” (the first was built in Parramatta Sydney in 1804) or housed nearby where they worked until they were assigned to new settlers to work as servants. Children of these women either stayed with their mothers, if their employer permitted, or they were sent to an orphanage.

After some 200 years of silence, neglect and misinterpretation, the contribution by these convicts to a unique “Australian society” is at last coming out of the closet.

The shame attached to the “convict taint” was still evident among the mid-twentieth century with respectable Britishers making Australians deny or hide that some felon could be hidden in their family tree.

The “Scottish Radicals” transported in 1820, were hardly known, yet they made a significant contribution to New South Wales. Nineteen were transported as a result of the affray at Bonnymuir near Stirling on 5<sup>th</sup> April, 1820. Two others, Baired and Hardie, were executed. James Clelland, one of the radicals, had been saved from execution. John Anderson was from 1823 to his death in 1858 at age of 65, schoolmaster of the Presbyterian school at the old church of Ebenezer on the Hawkesbury.

### **Development, Exploration and the Squatters**

After the development of the colony at Port Jackson, further settlements then began at Hobart (Tasmania) in 1803, on the Brisbane River (Queensland) in 1824 and on the Swan River (Perth, Western Australia) in 1829. Melbourne was established at Port Phillip Bay (Victoria) in 1835 and Adelaide at the Gulf of St. Vincent (South Australia) in 1836.

Explorations began along the coast and moved inland looking for greener pastures. Then Captain John Macarthur brought in the Spanish merino sheep and Australia developed from a prison to a pastoral colony. This was driven by the expansion of the wool growing industry coupled with a fervent desire on the part of settlers to acquire more and more land using labour from convicts and aboriginals.



Some of the Scottish became large landowners, such as the Darling Downs and Gippsland squatters, while large tracts of land were bought by companies in Glasgow and Edinburgh. A small group was also drawn to Australia by the prospect of trading as merchants.

The famous "Scottish Mechanics" were comprised of fifty-four adult men plus their families: stonemasons and bricklayers, carpenters, joiners, blacksmiths and plasterers. All were members of Christian churches and congregations. The Scots also became Governor General's, Governors and members of parliament.

### **The Gold Rush**

The gold rush began when gold was first discovered in 1851 at Bathurst (New South Wales), then later at Buninyong near Ballarat and Bendigo (Victoria). At first the authorities tried to keep the news at quiet as possible, for fear that it would seriously damage the agricultural economy by aggravating the chronic labour shortage. However, with the news of the wealth that had been created by the Californian gold rush, the government then publicized the discovery. Prospectors from all over the world rushed to Australia in the hope of making their fortune. Tent cities, some as large as 40,000 people, dotted the countryside.

The Eureka Stockade and its dramatic impact on Victoria are well known. By mid-1853, there were about 60,000 diggers, plus their families, on the Victorian goldfields; of these about 23,000 were at Bendigo. In June 1853, an Anti-Gold-Licence Association was formed at Bendigo to give voice to the diggers' many grievances about their conditions, centring on the 30 shillings monthly license fee they had to pay. The leaders of the Association were G.E. Thomson, Dr. Jones and an Irish-born American, "Captain" Edward Brown. These three drew up a petition which articulated the diggers' grievances and made a number of demands, including a reduced license fee, improved law and order, the right to vote and the right buy land.

The petition was signed by diggers at Bendigo, Ballarat, Castlemaine, Mcivor (Heathcote), Mount Alexander (Stawell) and other diggings. Signatories to the Petition were also J.L. Baird, James Baird and J.L. Bairde.

Although a claim was made that over 30,000 signatures were collected, in fact the petition carried about 5,000 to 6,000 (not including those from Heathcote, which were lost in a gold escort robbery). The petition was brought to Melbourne and presented to

Lieutenant-Governor C.J. La Trobe on the 1<sup>st</sup> August 1853. most of its demands, including the reduction in the license fee, were rejected.

The diggers continued to protest, though without violence and the license fee was increasingly evaded. Eventually, however, their grievances erupted in the events at Ballarat which culminated in the Eureka uprising on 3<sup>rd</sup> December, 1854 against British injustice.

- (13) Where were the first Australian convicts housed? \_\_\_\_\_ (2%)
- (14) What did some 50s Australian feel ashamed about when in polite British company? \_\_\_\_\_ (2%)
- (15) Who imported the first farm animals to Australia? \_\_\_\_\_ (2%)
- (16) What did terrible conditions during the gold rush result in? \_\_\_\_\_ (4%)

**Part 5:**

- (17) Due to the requirement of submitting academic theses for the completion of the MSc Courses, candidates are requested to conduct research. Please state the likely research area to be focused, the topic if possible (optional), the incentives or reasons, the methodology if possible (optional), and the contribution once the application is accepted. Also, please address the research idea in CHINESE using a paragraph with NO MORE THAN 10 lines. (10%)

**Part 6: 邏輯分析 (17%)**

1. 某公司甲乙兩部門原有相同之員工人數，甲部門有 30%的員工是女性，乙部門有 50%的員工是女性。但在乙部門調動 15 名女性員工至甲部門後，兩部門的女性員工人數相等。請問該公司兩部門共有多少員工？ (3%)
- (A) 100  
(B) 150  
(C) 200  
(D) 300  
(E) 400

2. 納稅額計算是基本稅額\$1050，加上對收入超出\$30,000的部分扣7%的稅，某人納稅總額為其收入的4%，這個人的收入是多少？(3%)
- (A) 35,000  
(B) 40,000  
(C) 45,000  
(D) 50,000  
(E) 55,000
3. 在大陸生產電腦的成本是在臺灣生產的70%，即使在考慮運費、稅金等相關費用後，自大陸進口仍然比較便宜。假設上述說法正確，則下列何者為真？(3%)
- (A) 大陸的人工成本為臺灣的70%  
(B) 自大陸進口電腦將使臺灣減少30%的電腦製造工作機會  
(C) 運費占大陸生產成本的比例大於30%  
(D) 在大陸生產所需的時間比在臺灣少30%  
(E) 相關費用佔臺灣生產成本的比率少於30%
4. 一個直角三角形，三邊長分別為 $n$ 、 $2n-1$ 、 $2n+1$ ，請問斜邊的長度是多少？(3%)
- (A) 8  
(B) 15  
(C) 17  
(D) 19  
(E) 21
5. 假設有五頂帽，其中三頂藍、兩頂紅。現任選其中三頂分給三人戴。該三人面向牆，排成一縱列。每人僅能看見前面的人(如果有的話)所戴帽的顏色，卻看不見自己所戴帽的顏色。我們先問最後一人知不知道其所戴帽的顏色，他回答說「不知道」，接著問中間之人，他亦回答說「不知道」。這時排在最前的一人竟然說「我知道」。到底排在最前的一人所戴帽的顏色為何？又他是怎麼知道的？(5%)

**Part 7: 文獻評析 (23%)**

近年來全球船舶除了快速化與大型化外，數量上更是呈現大幅成長。在航線不變的情況下，船舶數量大幅成長，卻也往往伴隨著海事事故案件的日益增加。根據過去資料顯示，一般最容易發生海事事故的區域，就是在港口及其臨近海域，特別是碰撞、觸礁與擱淺等意外。由於船隻在港口航行時，其周遭船舶數量最多，不僅交通繁忙，且與他船會遇交織之機率頻繁，加上靠近陸地，航道遠不如大洋中寬廣有彈性，故最容易發生意外事故。因此，對船舶航行安全之研究而言，在港口航行的階段，應是最值得深入探討的課題之一，然而過去的相關研究大多偏重在船舶的內部因素探討，如工作人員的疲勞、粗心、操作錯誤與訓練不

足等。但在實務上，除了人員因素外，船舶的外部航行環境，也會影響船舶在海上航行的安全性。通常就港口航行的船隻而言，影響船舶航行安全的外部環境因素，除了無法控制的天候外，最主要就是港口所提供之各項導航服務，例如港口的導航設施、航道的管制與引水人之領航技術等。

此外，港口之船舶航行安全，係影響該港口競爭力的重要指標之一；對航運和港口的業者而言，港口之船舶航行安全，可以增進其多重競爭利益。於是，如何能在加速港區整體物流作業，縮短船舶進出港與停靠碼頭時間的同時，亦能有效提昇船舶在港口航行之安全品質，將是確保港口競爭優勢及永續經營的重要議題。因此，本研究將由港口業者的觀點，應用品質機能展開法(Quality Function Deployment, QFD)來探討其如何改善船舶在港口航行之安全。QFD為一系統性的方法，一般主要應用於生產或服務業者的服務品質改善，其強調每一個產品在開發與製造階段，皆應將顧客的需求轉換成生產者或服務者之技術或服務作業的特性需求，並以此來制定其生產或服務的相關政策。一般就船舶在港口航行的作業而言，其主要服務者就是港口業者，其主要的顧客就是航行的船隻，而其主要的服務或產品就是港口的導航作業。本研究首先針對在港口航行船舶的船長，藉由其對港口業者所提供的各項導航服務作業的認知，來分析其在港口航行時之需求；其次，再依據船舶的進出港作業流程與各項導航作業的標準作業程序，來分析港口業者的服務作業特性；然後根據二者之分析結果來建立 QFD 模式，將港口航行的船長需求轉換為港口業者之服務作業特性的需求，並以此來制定港口業者改善船舶航行安全的相關政策。最後，為了驗證本研究模式在實務上的應用效度，係以國內某港口航行船隻之實際進出港作業為例，來進行模式的實證研究。研究結果顯示，該港口最需優先改善的服務作業特性是：航道交通管制、作業人員的緊急應變能力、作業人員的身心狀況與作業人員的溝通能力等四項。期可提供港口業者，作為制定提昇船舶航安政策的實務參考。

(摘自 Hsu, W. K. (2010), "The Navigation Safety of Ships in Ports", *Transportation Planning Journal*, Vol. 39, No. 3, pp. 301-322.)

1. 下列何者並非文章中所謂影響船舶於港口航行安全之外部環境因素？(3%)
  - (A) 船舶交通管理中心(VTC)
  - (B) 船長的操船技術
  - (C) 天候及地理區域
  - (D) 引水人的素質
  - (E) 堤防上的燈塔
2. 請說明文章中對船舶在港口航行安全之研究的重要性與前人研究不足之處為何？(8%)
3. 學術期刊投稿之摘要內容通常建議應包括研究之必要性、主旨、方法、程序及結果外，並應說明研究之重要貢獻。請以 350 字為限摘要本文大意。(12%)