國立臺灣師範大學 100 學年度碩士班招生考試試題

科目：**英文(科技應用管理組)** 適用系所：**工業教育學系**

注意：1.本試題共 6 頁，請依序在答案卷上作答，並標明題號，不必抄題。2.答案必須寫在指定作答區內，否則不予計分。

1. Please use Chinese to interpret (1) the purposes (5 分), (2) analytic methods (5 分), (3) conclusions (5 分) and summarize the following abstract (10 分) of an academic paper.

We examine the life cycle implications of a wide range of fuels and propulsion systems that could power cars and light trucks in the US and Canada over the next two to three decades. We review recent studies to evaluate the environmental, performance, and cost characteristics of fuel/propulsion technology combinations that are currently available or will be available in the next few decades. Only options that could power a significant proportion of the personal transportation fleet are investigated.

Contradictions among the goals of customers, manufacturers, and society have led society to assert control through extensive regulation of fuel composition, vehicle emissions, and fuel economy. Changes in social goals, fuel-engine-emissions technologies, fuel availability, and customer desires require a rethinking of current regulations as well as the design of vehicles and fuels that will appeal to consumers over the next decades.

The almost 250 million light-duty vehicles (LDV; cars and light trucks) in the US and Canada are responsible for about 14% of the economic activity in these countries for the year 2002. These vehicles are among our most important personal assets and liabilities, since they are generally the second most expensive asset we own, costing almost $100 000 over the lifetime of a vehicle. While an essential part of our lifestyles and economies, in the US, for example, the light-duty fleet is also responsible for 42 000 highways deaths, and four million injuries each year, consumes almost half of the petroleum used, and causes large amounts of illness and premature death due to the emissions of air pollutants (e.g. nitrogen oxides, carbon monoxide, hydrocarbons and particles).

The search for new technologies and fuels has been driven by regulators, not the marketplace. Absent regulation, most consumers would demand larger, more powerful vehicles, ignoring fuel economy and emissions of pollutants and greenhouse gases; the vehicles that get more than 35 mpg make up less than 1% of new car sales. Federal regulators require increased vehicle safety, decreased pollution emissions, and better fuel economy. In addition, California and Canadian regulators are concerned about lowering greenhouse gas emissions. Many people worry about the US dependence on imported petroleum, and people in both countries desire a switch from petroleum to a more sustainable fuel.

The fuel-technology combinations and vehicle attributes of concern to drivers and regulators are examined along with our final evaluation of the alternatives compared to a conventional gasoline-fueled spark ignition port injection automobile.

When the US Congress passed laws intended to increase safety, decrease emissions, and increase fuel economy, they did not realize that these goals were contradictory. By spending more money or by reducing the performance of the vehicle, most of the attributes can be improved without harming others. However, low price and performance are important attributes of a vehicle. To resolve these contradictions, regulators in the US and Canada need to specify the desired tradeoffs among safety, emissions, fuel economy, and cost, and a single agency needs to be designated in each country to oversee the tradeoffs among the regulators' attributes and those desired by consumers.

We discuss methods needed to evaluate the attractiveness of vehicles employing alternative fuels and propulsion systems including:
1. Predicting the vehicle attributes and tradeoffs among these attributes that consumers will find appealing; 2. assessing current and near term technologies to predict the primary attributes of each fuel and propulsion system as well as its externalities and secondary effects; 3. applying a life cycle assessment approach; 4. completing a benefit–cost analysis to quantify the net social benefit of each alternative system; 5. assessing the comparative advantages of centralized command and control regulation versus the use of market incentives; 6. characterizing and quantifying uncertainty.

An especially important feature of the analysis is ensuring that vehicles to be compared are similar on the basis of size, safety, acceleration, range, fuel economy, emissions and other vehicle attributes. Since it is nearly impossible to find two vehicles that are identical, we use the criterion of asking whether consumers (and regulators) consider them to be comparable. Comparability has proven to be a difficult task for analysts. No one has managed a fully satisfactory method for adjustment, although some have made progress. Absurd comparisons, such as comparing the fuel economy of a Metro to that of an Expedition, have not been made because of the good sense of analysts. However, steps should be taken to achieve further progress in developing methods to address this issue.

Comparing fuels and propulsion systems require a comprehensive, quantitative, life cycle approach to the analysis. It must be more encompassing than 'well-to-wheels' analysis. Well-to-wheels is comprised of two components, the 'well-to-tank' (all activities involved in producing the fuel) and 'tank-to-wheel' (the operation/driving of the vehicle). The analyses must include the extraction of all raw materials, fuel production, infrastructure requirements, component manufacture, vehicle manufacture, use, and end-of-life phases of the vehicle. Focusing on a portion of the system can be misleading. The analysis must be quantitative and include the array of environmental discharges, as well as life cycle cost information, since each fuel and propulsion system has its comparative advantages. Comparing systems requires knowing how much better each alternative is with respect to some dimensions and how much worse it is with respect to others. Since focusing on a single stage or attribute of a system can be misleading, e.g. only tailpipe emissions, we explore the life cycle implications of each fuel and propulsion technology. The necessity of examining the whole life cycle and all the attributes is demonstrated by the fact that CARB had to rescind its requirement that 2% of new vehicles sold in 1998 and 10% sold in 2003 be zero emissions vehicles.

Despite the many difficulties and complexities, there are some broad conclusions regarding LDV for the next two to three decades. The vehicle options likely to be competitive during the next two decades are those using improved ICEs, including HEVs burning 'clean' gasoline or diesel. An extensive infrastructure has been developed to locate, extract, transport, refine, and retail gasoline and diesel. Any alternative to petroleum would require a new infrastructure with attendant disruption and costs running to trillions of dollars. The current infrastructure is a major reason for continuing to use gasoline and diesel fuels.

Absent a breakthrough in electrochemistry, battery-powered vehicles will remain expensive and have an unattractive range. The failure to produce a breakthrough despite considerable research does not give much hope that vastly superior, inexpensive batteries will be produced within our time frame.

Fuel cell propulsion systems are unlikely to be competitive before 2020, if they are ever competitive. Although, fuel cells have high theoretical efficiencies, and do not need a tailpipe and therefore have vehicle emissions benefits over conventional vehicles, generating the hydrogen and getting it to the vehicle requires large amounts of energy. The current well-to-wheel analyses show that using a liquid fuel and onboard reforming produces a system inferior to gasoline powered ICEs on the basis of efficiency and environmental discharges. Storage of the hydrogen onboard the vehicle is another challenge.

Fischer–Tropsch liquids from natural gas and ethanol from biomass may become widespread. The Fischer–Tropsch liquids will penetrate if there are large amounts of stranded natural gas selling for very low prices at the same time that petroleum is expensive or extremely low sulfur is required in diesel fuel. Ethanol could become the dominant fuel if energy independence, sustainability, or very low carbon dioxide emissions become important—or if petroleum prices double.

Absent major technology breakthroughs, a doubling of petroleum prices, or stringent regulation of fuel economy or greenhouse gas emissions, the 2030 LDV will be powered by a gasoline ICE. The continuing progress in increasing engine efficiency, lowering emissions, and supplying inexpensive gasoline makes it extremely difficult for any of the alternative fuels or propulsion technologies to displace the gasoline (diesel) fueled ICE.

This conclusion should not be interpreted as one of despair or pessimism. Rather, the progress in improving the ICE and providing gasoline/diesel at low price has obviated the need for alternative technologies. Many of the technologies that we examine, such as cellulosic ethanol or Fishcher–Tropsch fuels from natural gas or HEVs are attractive. If there were no further progress in improving the gasoline/diesel fuel ICE or the fuel became more expensive, one or more of these options would take over the market. Thus, the fact that the current fuel and technology is so hard to displace means that society is getting what it wants at low cost.

Extensive progress has been made by analysts in examining the life cycles of a range of fuels and propulsion systems for personal transportation vehicles. The most important contribution of these methods and studies is getting decision-makers to focus on the important attributes and to avoid looking only at one aspect of the fuel cycle or propulsion system or at only one media for environmental burdens. The current state of knowledge should avoid the recurrence of the fiasco of requiring battery-powered cars on the grounds that they are good for the environment and will appeal to consumers.

Source: Modified from MacLean and Lave (2003)

2. Please translate the following sentences into English (25 分).

價值活動可依技術和策略劃分為主要活動與支援活動兩大構面，主要活動包括購入後勤、生產作業、輸出後勤、行銷與銷售與服務五項價值活動，支援活動可劃分為企業基礎結構、人力資源管理、技術發展、採購等四項價值活動，其分析則視產業而定。

3. 請將下面短文翻譯成中文(50分)

A global study of graduate management of technology programs

Since technology is a major driver of global economic development, industry increasingly seeks more effective ways to manage existing and nascent technology. Technology has become a great equalizer among companies and countries (Badawy, 1998). The strategic alignment of technological assets with a company's direction and management is a major issue in terms of impacting profitability and growth. Unfortunately, there have often been important mismatches between the graduates of universities and the skills needed by today's technology-based organizations (Mignogna, 2002).

Responding to this, management of technology (MOT) educational programs have been developing worldwide. Originating largely in the US and in a few Western European countries, MOT programs are now housed under the various academic schools (business, engineering, science, etc.) and have considerable diversity in their themes, focus, and course offerings. According to Kocaoglu, director of the engineering management program at Portland State University, more and more academic institutions are creating MOT programs. In 1976, there were fewer than 30 engineering management programs, but now there are nearly 200 worldwide, mostly at the graduate level (Santo, 2001). Particularly, the MOT field has emerged from its relative obscurity during the 1970s and 1980s to mainstream business management during the 1990s (Nambisan & Wilemon, 2002).

There have been several studies on the definition, scope, and skills needed in the MOT educational field (Mallick & Chaudhury, 2000; Zehner, 2000). The National Research Council defined MOT as "linking engineering, science, and management disciplines to address the issues involved in planning, development, and implementation of technological capabilities to shape and accomplish the strategic and operational objectives of an organization". It also identified eight primary needs in the technology management field (Weimer, 1991):

- How to integrate technology into the overall strategic objectives of the firm
- How to get in and out of technologies faster and more efficiently
- How to assess/evaluate technology more efficiently
- How to accomplish technology transfer

- How to reduce product development cycle time
- How to manage large, complex and interdisciplinary or inter-organizational projects/systems
- How to manage the organization's internal use of technology
- How to leverage the effectiveness of technical professionals

Badawy further defined MOT as "a field of study and a practice concerned with exploring and understanding technology as a corporate resource that determines both the strategic and operational capabilities of the firm in designing and developing products and services for maximum customer satisfaction, corporate productivity, profitability, and competitiveness" (Badawy, 1998). Simply stated, MOT attempts to answer the question of how an organization can maximize gains from its technological assets (Nambisan & Wilemon, 2002).

Source:

Satish Nambisan and David Wilemon (2003) A global study of graduate management of technology programs. *Technovation*, 23 (12), 949962