

**NANYANG TECHNOLOGICAL UNIVERSITY**

**SEMESTER 2 EXAMINATION 2009-2010**

**CV4000IMP4007/AE4007 – ENGINEERS AND SOCIETY**

April/May 2010

Time Allowed: 2½ hours

**INSTRUCTIONS**

1. This paper contains **FOUR (4)** questions and comprises **FIVE (5)** pages.
2. Answer **Question No.1 (COMPULSORY)** in **SECTION A** and **TWO (2)** other questions in **SECTION B**.
3. This is a Closed-Book Examination.
4. The questions do not carry equal marks.

**SECTION A: (COMPULSORY)**

1. For the following ten parts of this question, write down the answer to each part on the first page of your answer book. Indicate your answer in one of the options (i), (ii), (iii) or (iv):
  - (a) Which one of the following is not a direct reason contributing to the Britain's Loss of Industrial Leadership from 1850s onwards.
    - (i) Dominance of the Steam Combustion Engine
    - (ii) Rapid pace of industrialization in the United States
    - (iii) Neglected & undervalued Commercial Application
    - (iv) Discouraged Standardization

(2 Marks)
  - (b) The main source of energy for life on Earth is:
    - (i) Organic chemical compounds
    - (ii) Inorganic chemical compounds
    - (iii) Sunlight
    - (iv) Fossil fuels

(2 Marks)

**Note: Question No.1 continues on page 2.**

- (c) The two critical functions that an organism's survival depends on from its environment are:
  - (i) Provision of ecosystem and sustainable development
  - (ii) Provision of resources and absorption of wastes
  - (iii) Provision of photosynthesis and nutrients
  - (iv) Provision of air and water

(2 Marks)
- (d) Which law in Singapore protects a whistle blower?
  - (i) The Constitution of Singapore
  - (ii) The Professional Engineers Act
  - (iii) Workplace Safety and Health Act
  - (iv) There is no whistle blowing protection law in Singapore.

(2 Marks)
- (e) The National Wages Council (NWC) was created as a tripartite council of employers, union and government and has since 1972 proposed wage guidelines for Singapore. Which one of the following statements is FALSE?
  - (i) The founding chairman of the NWC was Professor Lim Chong Yah.
  - (ii) The NWC recommendations once accepted by the Government are legally binding and all employers and unions must follow and implement the recommendations.
  - (iii) The NWC recommendations serve only as guidelines for companies to implement their wage policy.
  - (iv) The NWC had generally encouraged the adoption of a flexible wage policy.

(2 Marks)
- (f) Which one of the following statements regarding Singapore's economic defence is FALSE?
  - (i) Singapore has foreign reserves for one year of imports to support livelihood of the nation during crisis.
  - (ii) Singapore has strategic food and oil reserves sufficient for up to six months.
  - (iii) Singapore provides 6% of GDP on defence even during economic crisis but generally spends 4 to 5% GDP on defence.
  - (iv) Singapore has no provision to mobilize civilian resources at short notice.

(2 Marks)

**Note: Question No.1 continues on page 3.**

(g) There are now ten member countries in ASEAN. Which is the last and 10<sup>th</sup> country to join this grouping in 1998?

- (i) Cambodia
- (ii) Laos
- (iii) Myanmar
- (iv) Vietnam

(2 Marks)

(h) The head of the World Bank is appointed by:

- (i) The European Union
- (ii) The Committee of World Bank donor countries
- (iii) The President of the USA
- (iv) The United Nations

(2 Marks)

(i) Law and order, during the colonial days of Singapore, were difficult to maintain due to the lack of:

- (i) A common language
- (ii) A strong police force
- (iii) Concern for the people by the government
- (iv) All of the above

(2 Marks)

(j) Maria Hertogh riots in Singapore were triggered by:

- (i) Religious insensitivity
- (ii) Racial insensitivity
- (iii) Maria Hertogh's Dutch parentage
- (iv) Police insensitivity

(2 Marks)

**SECTION B: ANSWER ANY TWO (2) QUESTIONS!**

2. (a) By the 19<sup>th</sup> century, the United States was able to challenge and subsequently overtook the pace of industrialization set by England, France and Germany. Discuss briefly the factors contributing to such a rapid pace of industrialization in the United States. (10 Marks)

(b) Singapore success story has been well-documented. It has transformed from economic debacle in the early 1960s to economic miracle in the 21<sup>st</sup> century. Discuss briefly the economic strategies for Singapore in the past, present and the future. (10 Marks)

(c) Why were strikes in Singapore, in the 1950s, widespread? What lessons were learnt that provided Singapore the essentials to evolve the highly successful harmonious labour environment today? (10 Marks)

(d) Why were Chinese Ethnic Clan, such as the Cantonese, Hokkien and Teochew, Associations so important in the 1900s? Are these associations still relevant in modern Singapore? (10 Marks)

3. (a) What are the main conclusions of the "Club of Rome Report: Limits to Growth" in 1972 and "Limits to Growth: The 30-year Update" in 2004? Explain the argument using the concept of "Earth Carrying Capacity". (10 Marks)

(b) What is systems thinking? What is a system? What are the habits of a systems thinker? (10 Marks)

(c) Discuss five of the most important lessons you have learnt from the case of Bhopal Chemical Disaster that we discussed in class. (10 Marks)

Note: Question No.3 continues on page 5.

- (d) When you realize that the department that you work in is about to commit an unethical act, what do you think your immediate action should be? Explain the merits of your suggested action. If your first action fails to prevent the unethical action, what should your next action be? What are the disadvantages of your second action? If your second action still fails to prevent the unethical action, what should your third action be? What are the dangers of your third action?  
(10 Marks)
  
- 4. (a) Singapore's economy has begun to recover from the global recession. Discuss briefly the measures taken by the government to cope with the recession and how is Singapore preparing herself for the post-recession world.  
(10 Marks)
  
- (b) Psychological defence is one of the pillars of Singapore's Total Defence strategy. Discuss the importance of psychological defence and what measures have been taken to ensure that this aspect is not neglected in Singapore's holistic approach for her defence.  
(10 Marks)
  
- (c) China is one of the world's fastest growing emerging economies. It has however many problems to overcome and its progress can be derailed. Describe some of the problems that China faces in its progress to become one of the world's most important economy.  
(10 Marks)
  
- (d) Economic globalization continues to outpace both political structures and moral sensitivity required for a just and sustainable world. Discuss some of the major problems encountered and objections to the present globalized economy.  
(10 Marks)

END OF PAPER



April/May 2010

19(1)

Engineers and Society – Semester 2 Exam 2009/2010

Q1

a) ii

b) iii

c) ii

d) iv

e) iii

f) iv

g) i

h) iii

i) iv

j) i

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Q2a) Britain marked out the highest point in industrial revolution in the late 18<sup>th</sup> century and hence shaped up the framework of human society to some extent. However, it lost its industrial leadership by 19<sup>th</sup> century due to several reasons.

Britain's university emphasized on pursuit of scientific knowledge and neglected undervalued commercial application.

Its dominance of steam engine delayed other forms of power development.

Industrialization in Britain was indigenous, more accommodated to the existing social structure.

British preoccupation with individually fitted final product discouraged standardization.

Pressure of adopt values and interests of industrialization were resisted by the ruling elite, hence

Britain did not change radically and barely done so even now.

Also, Germany challenges come in by creating state-owned national railway to open up internal market and expand foreign trade hence promoted education level to industrialization.

Also, in France, government set up a specialized army of corps of engineers and first engineering school.

Hence, with such development, France and Germany managed to excel in developing internal combustion engine without many competitors.

Besides that, there are challengers from US stepping on the industrialization too. America processes a frontier spirit of inventiveness in a manner that they always take knowledge as a commodity in order to satisfy human needs. Their entrepreneur designed industrial equipment help them to reduce the dependence on labour. And their innovative development of machine tools/equipments used in the system of manufacture enable them to produce highly standardized interchangeable parts.

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Q2b) Thirty years ago, Singapore's economic depended almost entirely on commerce and entrepot trade. Since then, Singapore has developed a strong capability in manufacturing, services, and good supporting infrastructure such as telecommunications, utilities and port services. However, other countries are also rapidly industrializing and, coupled with their abundant resources increasing their economic competitiveness. Due to its total lack of natural resources and a small population, Singapore's only mean to maintain its economic competitiveness is to move to an innovation phase of her development and promote activities with more innovative and design content. This means mastering Science and Technology is importance in Singapore economic strategies.

For the development of Singapore's future survival in research, innovation and technology, Singapore must increase her capacity to undertake research and development of international standard. The underlying rationale is that the development of technological capabilities will help sustain economic growth by rooting high value added activities in its economy. Today, strong manufacturing capabilities and efficient services in the economy are defined by superior technology, innovation and human resources.

The development of science and technology capabilities will support the upgrading and restructuring of Singapore's existing industry and business clusters. Enable Singapore to continue to serve as a highly competitive industry and business hub in the region.

Can support the shift in the manufacturing sector, from low value-added assembly activities to those with higher innovation and technological content.

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Q2c) The strikes and riots outbreak were the consequences of the communists in Singapore during 1950s.

After World War II, communist took advantage of post war problems to stir up the people's feeling against the British. They attacked the rubber plantations and tines mines in Malaya so frequently that the British government banned MCP and declared a state of Emergency. They attempted to influence the workers through some of important trade unions to go on strikes.

Also, they make use of the students in Chinese schools because the schools were not under government control.

The Chinese students were influenced as they were unhappy with the British government as they were not given equal opportunities for the entrance to University nor get well-paid jobs after graduated.

Hence, riots by the students broke out in many parts of the city. The notable one is Lee Hock Lee Bus Riots in 1954. Besides the students, the riots include 250 members of Singapore Bus Workers' Union which was formed in Feb 1954. They were unhappy with the poor and long working conditions and low pay.

At the same time, HLBC formed a rival union which recruited 200 spare drivers.

Both parties could not get on agreement and a strike was called. To make the matter worse, the strike was supported by Singapore Chinese Middle School students. Furthermore, police try to break the strike injured some people and this gain public support for strikers. Students were expelled and the schools involved were closed down.

The riots were resolved when the government intervned and ruled in favour of the workers and give in to the students. From these outbreaks, government realized the significant influence of the communist in the society and affects economic stability.

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Q2d) Yes, these Chinese Ethnic Clan associations are still relevant in modern Singapore. Personally, I am from Hainanese Youth Club. My grandfather, uncles and dad are the members of Hainanese associations too. I believe that it is very important to remember where our ancestor are from and pass on their dialect to the next generations too.

In the Hainanese Youth Club, we often have meetings and events. During such occasions, we are encouraged to speak our hainanese dialect among ourselves when we communicate so as to improve on our language too.

The older generations in the club wish that we could take over the club in the future and pass on to the next generation and so on. They do not wish that their dialect would be forgotten when the new generation are emerged.

It is believed that these clans are important in the 1990s because most elderly people only know how to speak their own dialects. Hence, in order to be able to communicate with them, especially in the Health care field, nurses and doctor must be able to communicate with the elderly in order to know their sickness.

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Q3a) Limits to Growth- Consequences of continued unabated resource use. If pollution is not controlled, reproductive capacity of the planet will be destroyed.

Main Conclusion stated that if the present growth trends (variables) remain unchanged, the LTG on this planet will be reached sometime within next one hundred years (by 2100), the most probable result will be a rather sudden and uncontrollable decline in both population and industrial capacity. This will happen as a gradual process and major disasters might occur.

And in 2004 Conclusion stated that the prediction by the same group of scientist is right. The use of resources and generation pollution are above sustainable levels.

Challenge in 1972 is to slow down, NOW is to get back down.

There is still hope, not inevitable in saving the earth's decline. We have to do something to prevent all these as 30 years have lost- the period of declining growth chosen by us or enforced by the plants.

Therefore, variables of limits to growth are world population, pollution, industrialization, food production and resource depletion which will directly affect the ECC which is determined by standard of Living, Technology, Metals, minerals, other resources, Waste assimilation, Energy, War, Disease, Food and fiber (land, nutrients, fisheries) and Water.

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Q3b) System thinking is a discipline for seeing wholes. It is a framework for seeing interrelationships rather than things for seeing patterns rather than static “snapshots”.

Today system thinking is needed more than ever because we are becoming overwhelmed by complexity. Perhaps for the first time in history, humankind has the capacity to create far more information than anyone can absorb to foster greater interdependency than anyone can manage, and to accelerate change far faster than anyone’s ability to keep pace.

Habits of System Thinker, firstly seek to understand the BIG picture. Holding the tension of affect paradox and controversy without trying to resolve it too quickly. And understand and consider how mental model affect current reality and the future.

Changes perspectives to increase the understanding (Viewing at different angle) Looking for patterns, trends, interdependencies and identifying complex cause and effect relationships and focusing on structure not on blame.

Uses Understanding of system structure to identify possible leverage actions by finding where unintended consequences emerge, consider both short and long term consequences of actions, recognize the impact of time delay and exploring cause and effect relationships.

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Q3c) The causes of the Bhopal incident is a combination of legal, technological, organizational and human errors. The 5 most important lessons to be learnt are failure of containment & safety measures, absence of community information and emergency procedures. These causes the poor safety facilities to happen such as:

- 1) Gauges measuring temperature and pressure were unreliable and works ignore early signs of trouble.
- 2) Refrigeration unit for keeping the MIC low temp is shut off.
- 3) Gas Scrubber to neutralize escaping MIC shut off. Can only handle 1/4 if on.
- 4) Flare Tower to burn off escaping MIC turned off, because waiting for replacement due to corroded pipe. Inadequately designed for its task, handle 1/4 if on.
- 5) Water Curtain to neutralize remaining gas was too short to reach the top.
- 6) Lack of effective warning systems, fail to signal the increase in temperature.
- 7) MIC storage tank filled beyond recommended capacity.
- 8) Reserve Storage tank suppose to held excess MIC was already filled with MIC.

In addition, Industrial safety Environmental laws & regulations not strictly enforce. They should have:

- 1) Brief people staying near the factory of the early signs of alerts.
- 2) Brief on how to operate the safety devices in case of accidents.
- 3) Local evacuation plan could be arrange to assure fast and smooth evacuation the case of accidents.

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Q3d) Firstly, I shall look for my boss, and discuss with him on this unethical act in the case. If my first actions failed to let my boss changed his mind, then I will do a detail and appropriate presentation to show the superior on the effects on consequences on the long. However, if my boss still does not change his mind and insist on the unethical way, it may more or less have some friction during the discussion and hence affect our relationship. Lastly, I will have to continue with this wrong action but I will still inform my customers and work with them to save the solution and try to cause as much damage as possible but it may result in unpaid work and no bonus/benefit. However with this action, the company would not suffer from too much loss. Although it violate personal engineering ethics but at least it is not being hide from the customers. And also convinced my boss on agreeing to this best solution, to overcome the loyalty part.

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Q4a) The recession in 1985/86 was triggered by the collapse of world commodity prices including oil. Singapore was affected because of the weaknesses found in our development model which includes:

- Lacked of diversification of source of growth.
- Over-reliance on manufacturing especially electronics and construction.
- Poor labour productivity gains relative to wage costs, amplified the downturn in our main export US and Japan.

Singapore dealt with the first economic recession in Singapore in 1985 by forming Economic Committee which was chaired by BG Lee and brought together public and private sector and union leaders to come out with immediate remedial action. The actions are:

- Targeting a more broad-based economic profile
- Leading towards a more diversified growth
- Implementation of series of cost-cutting measures (including CPF) to restore competitiveness

The economy recovered in 1986 after implementing those measures.

In order to ensure Singapore will emerge from the crisis stronger and more competitive. There are also short-term and long-term strategies that we have to implement.

The short-term measures include:

- Making foreign worker policies flexible
- Helping to find new job for unemployed
- Providing assistance scheme
- Providing continual education and training for workers

The long-term strategies include:

- Intensify globalization
- Promote entrepreneurship
- Pursue innovation
- Helping to find new job for unemployed
- Continue restructuring
- Enhance human capital

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Psychology defense is importance as it is the most difficult to build as it takes generations to do it and the measure to taken are:

- Will & Courage, spirit of oneness, loyalty and commitment
- Know What & Why you are fighting for
- Not about pragmatism, but altruism, idealism & patriotism.
- It is about risking life to protect integrity & sovereignty of Singapore
- To build confidence towards Singapore.
- Steadfast in nation belongings, patriotism/nationalism, a sense of destiny of nationhood,
- intimated by adversity and threat from external sources

Inculcate from young from education and family shall not be neglected, such as:

- Get rid of the kaisu & kaisi syndrome!
- Evolve the national ethos, the Singapore heartbeat as espoused in Singapore 21
- Without xenophobia, welcome foreigners and their challengers.
- Peace is not a given, it must be fight for a great price.
- Believe that we can overcome all odds & prevail eventually together.
- Facing adversity & challenge positively & courageously

Therefore, we should beef up psychological defense by:

- Set up NE for all citizens
- Tripartite participation in security exercise
- Heighten threat through mass media/publicity
- Undertake more social & community programs to foster greater sense of psychological awareness & national wellbeing

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|---|
| Q4c) China is still a developing country with many backward provinces. Their domestic problems require sustained economic growth to resolve.  |
| As China becomes more powerful, it will have to decide whether to be a hegemon, using its weight to create a sphere of influence in the region for its economic and security needs or to be a good International citizen because it can achieve better growth by observing international rules.                         |
| China joined the World Trade Organization in 2000.  |
| In the next 50 years the Chinese will have to complete three transitions:   |
| <ul style="list-style-type: none"><li>• from a planned to a market economy</li><li>• from a rural to an urban base</li><li>• from a tightly controlled communist society to an open civic one</li></ul>   |
| Several factors can derail China:   |
| Taiwan -any miscalculation by the two parties could bring about a conflict that will have disastrous consequences in the region. Hopefully the status quo is unchanged and the eventual reunification becomes a reality.  |
| -Rapid Urbanization- at present 30-35% of the 1.3billion Chinese live in small towns and cities. By 2050 they will be 80%, well informed and able through electronic means to mobilize for mass action.   |
| Widening differences in incomes, growth rates and quality of life between wealthy coastal provinces and disadvantaged inland provinces.   |
| Problems between Han and minority races in Tibet, Xinjiang and Qinghai.   |
| Different values and aspirations of the next generation-better education and global exposure will influence their thinking and expectations.  |
| One child family and the aging population.  |
| Corruption is embedded in the administrative culture and difficult to eradicate.  |
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- Q4d) The following are some global protests to alert us to the bad effects of globalization:
- In 1999, 10K of protesters shook Seattle city, causing severe damages and disruptions at the WTO meeting.
  - Anti-globalization protesters from all over the world converge at a general meetings of WTO, IMF, world Bank, etc
  - Fatal shooting at G8 Summit meeting in July 2001 at Italy
  - Suicidal case at Cancun meeting of WTO in 2003

Recent fast unexpected economic changes with insufficient control cause disruptions, sufferings, dislocations, unemployment, etc. Both rich and poor countries are not spared, with many poor countries get even poorer and hit by bad debts.

But protests from rich countries attract more attention from the media. These protesters identified globalization or global capitalism as their target. These protests do have some positive effects on countries get even poorer and hit by bad debts. But some basic issues cannot be solved easily

There are many basic problems with these world economic bodies like IMF and World Bank. They are very much controlled by USA whose first priority is its national interest.

They are not designed to act fast on such problems

They didn't put in enough control to reduce the raw and brutal effects of global capitalism

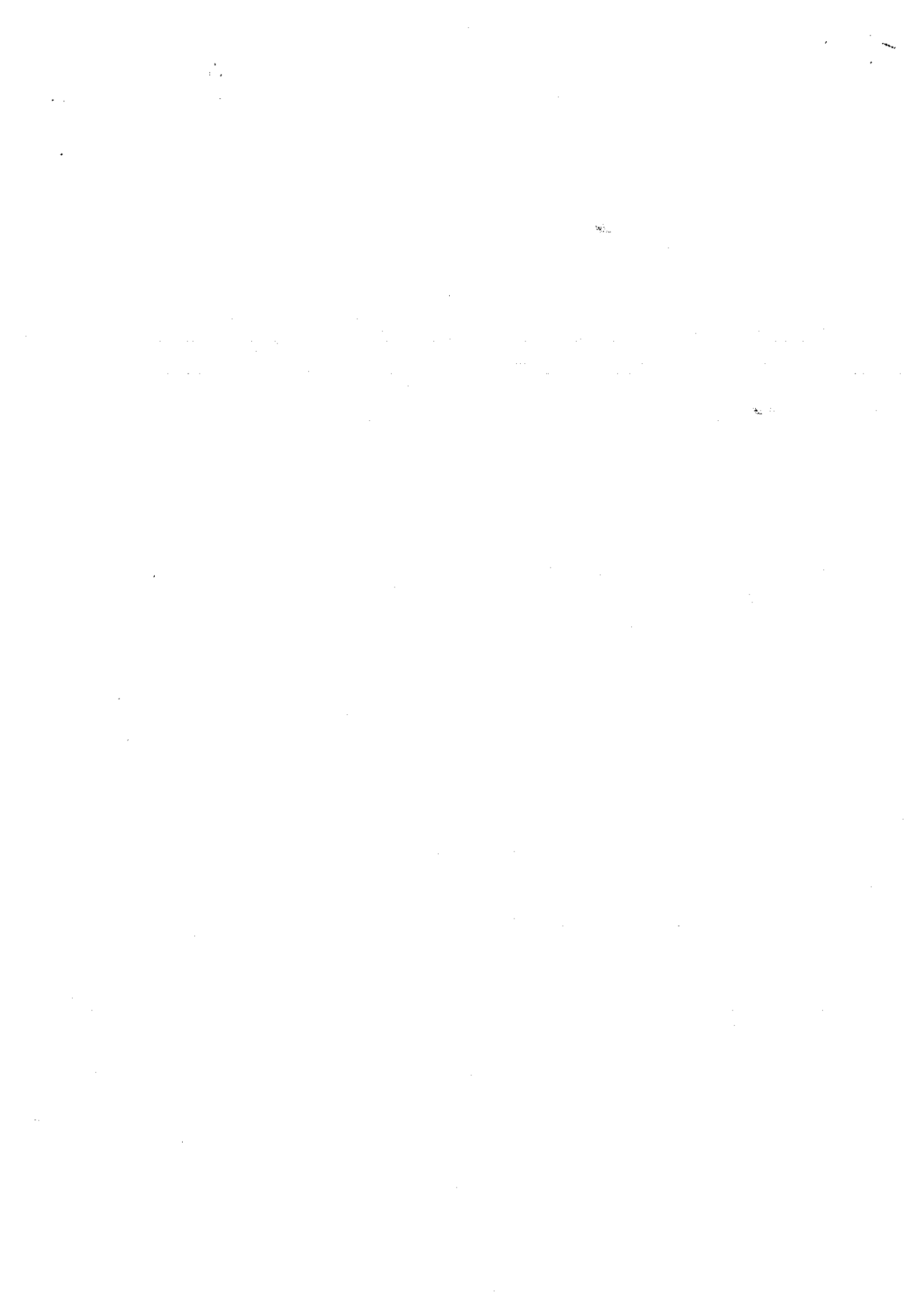
They didn't pay enough attention to correcting the worsening poverty in poor countries

In the New Economy, companies rise and fall very rapidly. One example is the story of the Dot.Com companies. Since mid 90s, there are high excitements and expectations about the potentials of e-commerce. It is easy to set up dot.com companies as not much capital is required. Some got listed in stock exchanges and their share prices rocket sky high, even with no profits. Eventually the bubble burst in mid 2000 and cause many disruptions.

After this e-commerce euphoria has subsided, internet business activities still continue, but mainly within companies and based on more rational decisions.

The inter speed and connectivity have cut out many middle-man activities, reduced inventory stocks, raised business efficiencies and intensified global competition.

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**SEMESTER 1 EXAMINATION 2010-2011**

**CY4000MP4007/AE4007 – ENGINEERS AND SOCIETY**

**December 2010**

**Time Allowed: 2½ hours**

**INSTRUCTIONS**

1. This paper contains **FOUR (4)** questions and comprises **SIX (6)** pages.
2. Answer Question No.1 (**COMPULSORY**) in **SECTION A** and **TWO (2)** other questions in **SECTION B**.
4. This is a Closed-Book Examination.
5. The questions do not carry equal marks.

**SECTION A: (COMPULSORY)**

1. For the following ten parts of this question, write down the answer to each part on the first page of your answer book. Indicate your answer in one of the options [(i), (ii), (iii) or (iv)].
  - (a) In the early days long before independence, the survival of Singapore was mainly due to which one of the following:
    - (i) A British Colony
    - (ii) A Multi-Racial Society
    - (iii) A Trading Post
    - (iv) A Part of the Straits Settlement(2 Marks)
  - (b) In 1991 the Constitution of Singapore was amended to provide for:
    - (i) an elected President whose powers are limited to performing ceremonial functions
    - (ii) an elected Council of Presidential Advisors with powers to safeguard the Singapore's Central Provident Fund
    - (iii) an elected President whose powers include the safeguard of Singapore's national reserves and the veto of appointment to public office
    - (iv) a limited number of nominated Members of Parliament(2 Marks)

**Note: Question No. 1 continues on page 2.**

CY4000MP4007/AE4007

- (c) Which one of the following statements regarding the economic defence of Singapore is FALSE?
  - (i) Singapore provides for protection of its sea and air routes
  - (ii) Singapore has foreign reserves sufficient for one year of imports to support livelihood of the nation in a crisis
  - (iii) Singapore has strategic food and oil reserves sufficient for up to six months
  - (iv) Singapore provides for civilian resources to be mobilized when the crisis exceeds one year(2 Marks)
- (d) The Chairmanship of ASEAN is rotated annually based on the alphabetical order of the English names of the Member State. The Chair of ASEAN for the year 2010 is Vietnam. The Chairmanship for 2011 is:
  - (i) Brunei Darussalam
  - (ii) Cambodia
  - (iii) Indonesia
  - (iv) Thailand(2 Marks)
- (e) In 1954, the Legislative Assembly was set up as the new form of government in Singapore. Who became the 1<sup>st</sup> Chief Minister of Singapore then?
  - (i) Lee Kuan Yew
  - (ii) Lim Yew Hock
  - (iii) David Marshall
  - (iv) William Farquhar(2 Marks)
- (f) There was a referendum held in Singapore for the following purpose:
  - (i) Introduction of the Presidency to become a popularly-elected office
  - (ii) To decide on the merger and the Island's position within the Federation of Malaysia
  - (iii) To decide on making request to the British for full self government
  - (iv) To decide on the new constitution for the Republic of Singapore(2 Marks)

**Note: Question No. 1 continues on page 3.**

CV4000/MP-4007/AE-4007

(g) The challenge of Sustainable Development arises from these two major converging trends:

- (i) Exponential increase in fossil fuel consumption and pollution
  - (ii) Global warming and pollution
  - (iii) Decline in fresh water supply and increase in water pollution
  - (iv) Decline in resource availability and ecosystems and increase in population and consumption
- (2 Marks)

(h) The Planetary Boundaries analysis presented in Nature is a "proof-of-concept" analysis, with some proposed boundaries. Which of the following is not being considered as part of the Planetary Boundaries by the author?

- (i) Population growth
  - (ii) Rate of diversity loss
  - (iii) Climate change
  - (iv) Chemical pollution
- (2 Marks)

(i) There was a very serious incident in Bhopal, India. Which of the following reasons was known not to be a cause?

- (i) Sabotage by disaffected employee(s)
  - (ii) Careless operations of the facilities by worker(s)
  - (iii) Terrorist act by religious extremists
  - (iv) Deteriorated conditions of the facilities
- (2 Marks)

(j) What do you think the young engineer ("David") in the Gilbane Gold case could have done in handling the toxic discharge problem so that he would not get himself into problems with his employer and the environmental authority?

- (i) Report the true concentrations of the waste water discharge to the authority as recommended by the consultant.
  - (ii) Perform more research on how the amount of toxic discharge could be reduced without incurring too much cost
  - (iii) Request Engineering Society to provide solutions as recommended by the professor
  - (iv) "Blow whistle" to the reporter so that he will not be held responsible by the authority
- (2 Marks)

CV4000/MP-4007/AE-4007

**SECTION B: [ANSWER ANY TWO (2) QUESTIONS]**

2. (a) History has taught us that human beings had used their intellectual abilities to overcome obstacles to improve the living environment. Discuss briefly any two developments/contributions/inventions by mankind that exemplified each of the following timelines in the history of engineering.

- (i) The Roman Empire Period
  - (ii) The Renaissance Period
  - (iii) The Scientific Revolution
  - (iv) The Agricultural Revolution
  - (v) The Industrial Revolution
- (10 Marks)

(b) Knowledge is essential for survival in this ever-changing and competitive world. Discuss briefly how the Singapore Government has prepared her citizens to meet the challenges of a knowledge-based economy.

(10 Marks)

(c) What do you think is the best lesson that you can learn from the case study "Testing Water and Ethics"?

(10 Marks)

(d) Discuss three advantages of having Engineering Codes of Ethics to you in your practice as an engineer.

(10 Marks)

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3. (a) Riots by workers and students broke out in many parts of Singapore in the 1950s. The notable ones are the Hock Lee Bus Riots of 1954 and Chinese Middle Schools Riots in 1956. Briefly describe these two riots, their causes and consequences. (10 Marks)
- (b) Briefly describe the background and outcome of the first and only National Referendum held in Singapore. (10 Marks)
- (c) Eco-efficiency is a popular concept promoted to organisations for sustainable development. Discuss the concept as an approach to move towards sustainability particularly highlighting any limitations. Also, give examples of how it has been applied by organisations. (10 Marks)
- (d) What is systems thinking? What is a system? Explain how the approach can be adopted for sustainable development. (10 Marks)

CV4000/MP4007/AE4007

4. (a) Discuss some of the constraints and challenges for a sustainable growth of Singapore's economy. (10 Marks)
- (b) There are five components in the total defence of Singapore namely military, economic, civil, social and psychological defence. Discuss various aspects of Singapore's social defence including the need for and integration of "foreign talents", a term used commonly to refer to new immigrants. (10 Marks)
- (c) Compare and contrast the emerging economies of China and India. Discuss their relative strengths and weaknesses as well as the challenges they have to overcome. (10 Marks)
- (d) Economic globalisation has brought about changes to the economies of many countries. The benefits are not fairly shared by all and many have in fact suffered as a result of globalisation. Discuss the shortcomings of globalisation and what can be done to improve it. (10 Marks)

END OF PAPER



December 2010

SECTION A: (COMPULSORY)

Pg (1)

Question 1

(a) iii

(b) iii

(c) iv

(d) iii - The ten Member States of ASEAN had unanimously agreed to Indonesia's request for a swop of ASEAN Chairmanship with Brunei Darussalam for the year 2011.

source: <http://www.aseansec.org/24547.htm>

(e) iii

(f) ii - in Sustainable Development - Global Trends notes

(g) iv

(h) i

(i) iii

(j) ii

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SECTION B: (ANSWER ANY TWO (2) QUESTIONS)

Question 3 (a)

In the 1940s, communists attacked rubber plantations and tin mines in Malaya in rebelling against the then ruling Britain forcing the British government to declare a state of Emergency in Malaya. Realizing that their activities in Malaya yielded no positive results, the communists turned their attention to the trade unions and Chinese schools in Singapore. The Chinese schools became one of the targets because at that time, the Chinese Schools were not under the government control and students from Chinese schools were not given equal opportunities and were unable to get well paid jobs when they graduate.

HOCK LEE BUS RIOTS

In April 1955, workers from Hock Lee Amalgamated Bus Company began on strike. These workers were members of the Singapore Bus Workers' Union protesting against the poor working conditions, long working hours, and low pay. Furthermore, they also felt threatened by a rival union which was supported by the bus company to counter any labor action by the Singapore Bus Workers' Union.

Buses stopped leaving the depots which crippled the city's entire transport system. In addition, students from the Chinese schools also came in buses to join the strikers to show support for them. It was rumored that the riot was instigated by the communists; but it was believed that it could be fanned by anti-colonial sentiments too because a minority government had just been formed from a narrow victory in the recent Legislative Assembly Election.

The riot resulted in 15 injuries which gained more public sympathy and support for the strikers and this was exactly what the communists had wanted to achieve.

CHINESE MIDDLE SCHOOL RIOTS

The Chinese Middle School Riots is made up of a series of riots. In 1956, Lim Yew Hock replaced David Marshall as Chief Minister of Singapore and had taken tough measures to suppress any communist activities. His act was supported by the then British Governor and the Commissioner of Police.

Two pro-communist organizations were deregistered and banned. The organizations are the Singapore Women Association and the Chinese Musical Gong Society. Besides that, the Singapore Chinese Middle School Student Union was also forced to dissolve.

Students gathered and camped at Chung Ching High School and the Chinese High School and sat in over the next two weeks, organizing meetings and holding demonstrations. The government issued an ultimatum that the schools be vacated. However, nearing the date, more people gathered and riots started at the Chinese High School and spread over to other parts of the island.

The riots resulted in 13 people being killed and more than 100 injured.



Pg 2)

Question 3 (b)

The Singapore national referendum of 1962 (also known as Merger Referendum of Singapore) was the first and only referendum held in Singapore. The referendum called for people to vote on the terms of merger with Malaysia. Some of the options deal with questions of national identity, however there was no option to vote against the merger which ironically was what took place years later.

Three options were presented to the people:

Option A, which was supported by the PAP, that Singapore retains certain power over certain areas after the Merger which had been discussed previously;

Option B which supports an unconditional merger for Singapore as a state on an equal basis with the other states;

Option C, which was supported by the Pro-UMNO party, that Singapore's status be no different from other states

The Barisan Socialis called upon voters to cast blank votes and reject the merger; however, the then ruling PAP earlier ruled that blank votes would be counted as for Option A.

On the 1<sup>st</sup> of September 1962, the polling obtained a total of 90% turn out rate with 71.1% rooting for Option A. Without the blank votes, Option A obtained a total of 45.3% of the votes.

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Question 3 (c)

Eco-efficiency aims to deliver competitively priced goods and services while progressively reducing environmental impacts and resource intensity to a level at least in line with the Earth's estimated carrying capacity.

The seven principle approaches proposed by the eco-efficiency method includes:

- Reduces material intensity
- Reduces energy intensity
- Reduces dispersion of toxic substances
- Undertakes recycling
- Capitalize on renewable
- Extend product durability
- Increase service intensity

In order to achieve sustainability, eco-efficiency proposes four methods as follow:

- Re-design product
- Re-think market (new ways to meet customers' needs)
- Re-engineer processes
- Re-valorize by-products

However, the limitation to eco-efficiency is that increasing efficiency might not enough, for there is a need for absolute cutback in the resources used!

Examples of company adapting eco-efficiency method include Nokia which comes up with smaller and lighter designs which greatly reduces the material used; and VW Lupo which produces innovative design with eco-efficiency elements such as minimizing wastes and emissions, and designed for dismantling and recycling.

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Pg (31)

Question 3 (d)

Systems thinking is a way of thinking about, and a language for describing and understanding the forces and inter-relationships that shape the behaviors of systems. In other words, systems thinking is the process of understanding how things influence one another within a whole.

System refers to any group of interacting, interdependent, related parts that form a complex and unified whole, that whole having a purpose. A system maintains its existence through the interaction of its parts.

To adopt systems thinking for sustainable development, we should uncover the underlying structures which form the patterns and events which are often only visible to us. This is because the basis of systems thinking is to see the system as a whole!

Systems thinking proposes seven thinking skills:

- Dynamic thinking (trends over time) instead of static thinking
- System-as-cause thinking
- Forest thinking
- Operational thinking (look for causality)
- Closed-loop (feedback) thinking
- Qualitative thinking
- Scientific thinking instead of looking for answers

With the thinking skills, we could identify the underlying root(s) of the issue and uses computer simulations and a variety of diagrams and graphs to model, illustrate and predict system behavior.

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Question 4 (a)

Some of the constraints and challenges for a sustainable growth of Singapore's economy include:

LAND SCARCITY

Singapore needs to integrate and optimize its land use in resolving its constraints in size which results in land scarcity. Besides that, the challenge has also been resolved by finding hinterland in other parts of the world such as the America, Europe and Japan where modern communication and transportation has made it possible.

LABOR SHORTAGE AND AGING WORKFORCE

In dealing with the challenges of having labor shortage and a aging workforce, the Singapore government has to make foreign worker employment flexible besides providing continual education and training for the lower income group. To minimize the unemployment percentage, levy for cheap foreign labor needs to be increased so that companies would employ locals. Furthermore, there is a need to boost local pool of researchers so that more local talents will take up research and development (R&D) jobs which serves as the base of the Singapore's currents economy. In order to boost this local pool of researchers, there is a need to attract foreign R&D manpower and this could be done by providing scholarships for foreign students, as well as providing funds to attract experienced first-rate R&D leaders and research professors.

DRINKING WATER

The issue of not having enough clean drinking water has been temporarily solved after the signing of water agreement with Malaysia. However, the agreement is only valid till year 2061 after which the issue will hopefully solved by the NeWater.

Besides that, to achieve a sustainable growth of Singapore's economy, there is a need to develop entrepreneurship and venture capital industry in Singapore. The economy has to be diversified by not only concentrating on manufacturing, but also to include R&D, services and marketing. Moreover, there is also a need to help upgrade the local small and medium enterprises (SMEs) to keep their competitiveness both regionally and globally, as well as to help shift from low-value industries to higher-value added industries. And lastly, there is also a need to preposition Singapore for new emerging clusters such as the green logistics so as to better prepare Singapore for the change with advantage!

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Def (A)

Question 4 (b)

Total defense is the defense in totality, not just about military defense, but a comprehensive term that is all encompassing, affecting every fabric of our lives. Total defense is not just about the head knowledge, but be internalized and touch the heart and soul, from which altruistic and selfless action follow.

Total defense is made up of five components:

- Military - hardware
- Economy - hardware
- Civil - hardware
- Social - software
- Psychological - 'heart'ware!

Social defense is the social glue that binds people together, in creating national cohesion which is important for multi-racial, multi-religious society such as here in Singapore. Therefore, social defense aims to create a caring society with 5C: compassion, cohesion, community, commitment, contribution.

In order to achieve the ultimate goal, it requires the tripartite cooperation of the 3Ps: public, private and people sectors for social cohesion and harmony.

With the cooperation of the 3Ps, social defense promotes "go global, stay anchored" which promotes the sense of belonging in Singaporeans who are overseas but remained concern about the national affairs. Furthermore, there is a need to care for the aged and sick since the nation has an aging population.

Besides that, ethnic self-help groups e.g. Mendaki, CDAC, Sinda, EAS also play a part in promotion national cohesion by organizing joint activities to increase bonding and mutual appreciation in the multi-cultural multi-religious society.

Moreover, the integration of "foreign talents" has also become part of the social defense because of the growing percentage of new immigrants in Singapore. Patience and understanding helps Singaporeans and the new immigrants understand each other and thus are able to live harmoniously together, which contributes indirectly to the prosperity of the country.

Last but not least, it requires laws and acts such as the Internal Security Act and Religious Harmony Act, to safeguard the internal security should disputes which cannot be solved take place.

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Question 4 (c)

The comparison between China and India's strengths and weaknesses in terms of their population, political views and economic strength are as follow:

| CHINA                                       | INDIA  |
|---|--|
| • A tightly controlled communist society.   | • World's largest democracy with a colonial legacy                 |
| • One child policy with an aging population | • Runaway population growth giving a young and vigorous population |
| • Strong economic strength                  | • Capital scarce with investments highly concentrated overseas     |

The comparison between China and India's social issues and the problems they have to face are as follow:

| CHINA  | INDIA   |
|--|---|
| • Political dispute with Taiwan                    | • Political dispute with Pakistan             |
| • Disputes between the Hans and the minority races | • Caste system                                |
| • Rapid urbanization                               | • Extreme of poverty and wealth               |
| • Corruption                                       | • Under-spending on education                 |
|  | • Poor infrastructure and poor public hygiene |
|  | • Corruption                                  |

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Pg (5)

Question 4 (d)

Globalization means that the world is getting smaller, increasingly connected, changing faster, yet more difficult to grasp. The two main reasons which brought about globalization are the end of cold war and the development of info-communication technology.

The shortcomings of globalization include:

- Disruptions within a country and unemployment as a result of insufficient control of globalization
- Poor countries get poorer and hit by debt while rich countries reap the profits
- Companies rise and fall very rapidly
- Advances material value over other values such as concern for the environment
- Undermines democracy in some developing countries e.g. Afghanistan
- The economy is very much controlled by the United States of America via the World Bank

However, facing the situation, there are several things that we can do to improve it, and they are:

- Moving towards a knowledge-based economy which sees knowledge as resources which is very important for countries without land and other natural resources such as Singapore
- Keep up with news and current events
- Keep up with business and technological trends so that we would not lose out in advancing
- Analyze every piece of information that we're exposed to before absorbing it
- Be innovative and creative
- Learn how to learn
- Appreciate liberal arts to cultivate an innovative and creative mind
- Focus on CQ (curiosity quotient) and PQ (passion quotient) instead of IQ (intelligence quotient)

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**NANYANG TECHNOLOGICAL UNIVERSITY**

**SEMESTER 2 EXAMINATION 2010-2011**

**CV4000/MP4007/AE4007 – ENGINEERS AND SOCIETY**

May 2011

Time Allowed: 2½ hours

**INSTRUCTIONS**

1. This paper contains FOUR (4) questions and comprises FIVE (5) pages.
2. Answer Question No.1 (COMPULSORY) in SECTION A and TWO (2) other questions in SECTION B.
4. This is a Closed-Book Examination.
5. The questions do not carry equal marks.

**SECTION A: (COMPULSORY)**

1. For the following ten parts of this question, write down the answer to each part on the first page of your answer book. Indicate your answer in one of the options [(i), (ii), (iii) or (iv)].
  - (a) Which one of the following statements is correct?
    - (i) The agricultural revolution set the stage that led to the scientific revolution.
    - (ii) Settlers in US were extremely utilitarian and saw knowledge as a commodity to satisfy human needs.
    - (iii) Romans inherited Greek philosophy & mathematics but also encouraged abstract science.
    - (iv) The Germans were proud of the invention of the steam engine.(2 Marks)
  - (b) The two critical functions that an organism's survival depends on from its environment are:
    - (i) Provision of energy and nutrients
    - (ii) Provision of sunlight and photosynthesis
    - (iii) Provision of food and shelters
    - (iv) Provision of resources and absorption of wastes(2 Marks)

Note: Question No.1 continues on page 2.

- (c) The most important factor contributing to Singapore's flourishing trade after Sir Stamford Raffles founded Singapore is:

- (i) Good workforce
- (ii) Good leadership
- (iii) Good geographical position
- (iv) Good safety

(2 Marks)

- (d) In 1954, the Legislative Assembly was set up as the new form of government in Singapore. Who became the first Chief Minister of Singapore then?

- (i) Lee Kuan Yew
- (ii) David Marshall
- (iii) Stamford Raffles
- (iv) Lim Yew Hock

(2 Marks)

- (e) The challenge of sustainable development arises from these two major trends:

- (i) Climate change and increase in pollution
- (ii) Decline in fresh water supply and increase in water pollution
- (iii) Decline in food supply and global warming
- (iv) Decline in resource availability & ecosystems and increase in population & consumption

(2 Marks)

- (f) Which of the following situations can be considered as a conflict of interest?

- (i) A student has to decide whether to spend more time on his final year project or preparing for his final examinations
- (ii) An engineer working in one of the Singapore Integrated Resorts but who is against gambling
- (iii) One is sitting on a Tender Committee evaluating the proposal of a company where his/her brother works for
- (iv) Someone who holds substantial shares in a competitor company

(2 Marks)

Note: Question No.1 continues on page 3.

(g) Which one of the following was instituted in 1970 to manage short term volatilities and regulate all elements of monetary, banking and financial aspects of Singapore?

- (i) Development Bank of Singapore
- (ii) Government Investment Corporation
- (iii) Monetary Authority of Singapore
- (iv) Singapore Central Bank

(2 Marks)

(h) We should always remember and honour our heroes some of whom even gave their lives in World War II so that Singapore and Malaya might be the home of free people who could once again enjoy peace, prosperity and happiness. One such group of people belonged to a British-led underground group called:

- (i) Singapore Resistance Force
- (ii) Operation World War II
- (iii) Force 136
- (iv) Singapore and Malaya Underground Intelligence Group

(2 Marks)

(i) The Asean Regional Forum includes members of many major powers such as the United States, Japan, European Union, Russia, China and India who agreed to join and attend annual summit meetings to discuss:

- (i) Free Trade Agreements
- (ii) Regional security issues
- (iii) Regional economic issues
- (iv) Regional climate change issues

(2 Marks)

(j) The concept of a World Wide Web (a system for creating, organizing, and linking documents so that they can be easily browsed over the internet) was developed and the first Web site was posted in 1991 by:

- (i) Vint Cerf and Bob Kahn
- (ii) Steve Jobs
- (iii) Bill Gates
- (iv) Tim Berners-Lee

(2 Marks)

**SECTION B: ANSWER ANY TWO (2) QUESTIONS!**

2. (a) Since the beginning of mankind, Science has contributed significantly to the betterment of our lives. Briefly discuss any three Scientific Discoveries that propelled the Industrial Revolution from early 16<sup>th</sup> to early 18<sup>th</sup> centuries. You should discuss the nature and application(s) of their discoveries. (10 Marks)

(b) The Singapore Government has put strong emphasis on the importance of research, innovation and technological development for the future of Singapore. Briefly discuss why they are important for the survival of Singapore. (10 Marks)

(c) Give four reasons why the Engineers' Codes of Ethics are important. (10 Marks)

(d) What can an ethical theory do? What is the essence of each of the five types of ethical theories that have been especially influential? (10 Marks)

3. (a) What are the main conclusions of the "Club of Rome Report: The Limits to Growth" in 1972 and "Limits to Growth: The 30-year Update" in 2004? Explain the reasoning of the report by the authors using the concept of "Earth Carrying Capacity". (10 Marks)

(b) What is a system? What is "systems thinking"? Use the model of "Events", "Patterns" and "Structure" to explain the concept of "systems thinking". Use an example to illustrate the concept. (10 Marks)

Note: Question No.3 continues on page 5.

- (c) A series of racial riots took place in Singapore during 1964 between Chinese and Malay groups. Briefly describe the causes and consequences. (10 Marks)
- (d) Briefly describe the reasons and issues of the merger and subsequent separation of Singapore with Malaysia. (10 Marks)
4. (a) How did the Singapore government steer the country successfully through the recent global recession? Discuss the plan for the next phase of Singapore's economic growth. (10 Marks)
- (b) Describe briefly the five components of Total Defence. In order to operationalise Psychological defence, Singapore embarked on a National Education programme which seeks to convey five 'messages'. What are they? (10 Marks)
- (c) Singapore is a very small country not only in land area but also in population size. Discuss how Singapore through diplomacy and good international relations secure the protection of larger nations and managed to exercise some influence on global issues. (10 Marks)
- (d) In the new economics land, labour and capital are no longer the only factors of production. With the application of knowledge, output can be increased beyond the potential of the three classical factors of production. Discuss how knowledge will be the key to Singapore's future. (10 Marks)

END OF PAPER



May 2011

Section A

1)(a) ii

(b) iv

(c) iii

(d) ii

(e) iv

(f) ii

(g) iii

(h) iii

(i) iii

(j) iv

Section B

2)(a) The three scientific Discoveries that propelled the Industrial Revolution from early 16<sup>th</sup> to early 18<sup>th</sup> centuries were the discovery of using steam power for machinery, the discovery of using coal to smelt iron and the discovery of the railway.

In the early 17<sup>th</sup> century, steam power was harnessed for use in machines. This discovery was the driver of new machinery which were more efficient and set the stage for British industries to achieve world leadership. It allowed quicker and more efficient production processes which completed the transformation to modern industrial production.

In 1709, Adam Darby discovered how to use coal to smelt iron. Smelted iron became an important raw material to make machines and structures. This discovery aided in the profusion of machines for mechanized tasks which propelled the Industrial Revolution.

In 1825, wrought iron rails were introduced and the success of George Stephenson's "Rocket" locomotive in 1829 set the stage for the railway age. It enabled the ability to move people and goods quickly, reliably and economically. This opened up broader markets for goods and services which was a major factor in the colonialization of much of the rest of the world.

(b) There are various reasons as to why the Singapore Government has put strong emphasis on the importance of research, innovation and technological development for the future of Singapore.

Firstly, the development of technological capabilities will help to sustain economic growth by rooting high value added activities in the Singapore economy.

Secondly, with superior technology, innovation and human resources, they will be translated into strong manufacturing capabilities and efficient services in the economy.

Thirdly, the development of science and technology capabilities will support the upgrading and

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restructuring of Singapore's existing industry and business clusters. This is important in enabling Singapore to continue to serve as a highly competitive industry and business hub in the region and enhance her attractiveness to MNCs and encourage them to root their operations here. Moreover, it will be able to support the shift in the manufacturing sector from low value added assembly activities to those with higher innovation and technological content.

Lastly, technological development is needed to pre-position Singapore for new emerging clusters to build up a comparative advantage in these higher value added industries. Additionally, Singapore needs a few prominent industry and business clusters that are sufficiently strong to serve as anchors to enable the economy to perform well.

(c) Engineer's code of ethics are important to serve and protect the public, in providing guidance to engineers, to provide shared standards and to act as a deterrent and enforcing discipline.

Engineering involves advanced expertise that professionals have and the public lacks and also considerable dangers to the vulnerable public. Since trust and trustworthiness are essential between the public and professionals, the code of ethics functions as a commitment by the profession as a whole that engineers will serve the public health, safety and welfare.

The Engineer's code of ethics provides helpful guidance by articulating the main obligations of engineers. Since they are brief, they offer general guidance and are well-written to identify primary responsibilities.

Since there is a diversity of moral viewpoints among individual engineers, it is important to have explicit standards, in particular minimum but hopefully high, standards. Therefore, with the Engineer's code of ethics, the public is assured of a standard of excellence on which it can depend and professionals are provided a fair playing field in competing for clients.

The codes can also serve as a formal basis for investigating unethical conduct. This provides a deterrent for immoral behaviour. Since the Professional Engineers Board can revoke the right to practice engineering in Singapore, this can be a powerful sanction when combined with the loss of respect from colleagues and the local community that such action is bound to produce.

(d) An ethical theory seeks to provide a comprehensive perspective on morality that clarifies, organises and guides moral reflection. It provides a framework for making reasonable moral choices and resolving moral dilemmas – not a simple formula but rather a unifying way to identify and integrate moral reasons.

Rights ethics teaches that one ought to respect human rights such as property rights or the rights to life. Duty ethics teaches one to respect individuals' rational autonomy. Utilitarianism states that one should maximise the overall good, taking into equal account all those affected by one's actions. This involves weighing the costs and benefits. Virtue ethics states that good character is central to morality. Lastly, self-realisation ethics emphasizes the moral significance of self-fulfillment.

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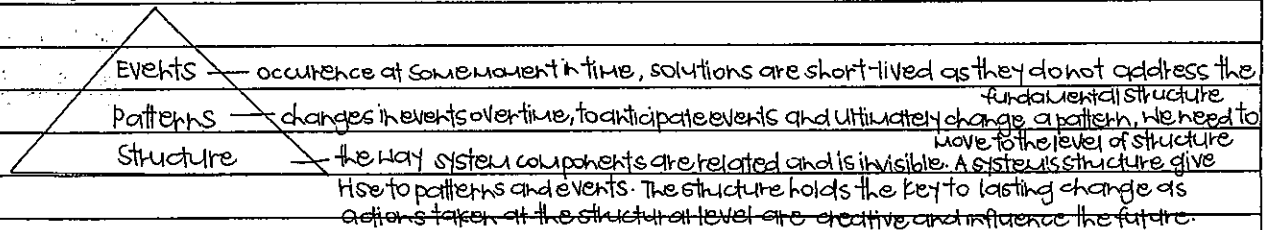
3)(a) The main conclusions include the consequences of continued unabated resource use. It maintains that if pollution is not controlled, the reproductive (carrying) capacity of the planet will be destroyed. If the present growth trends in world population, industrialization, pollution, food production and resource depletion continue unchanged, the limits to growth on this planet will be reached sometime in the next one hundred years. The most probable result will be a rather sudden and uncontrollable decline in both population and industrial capacity.

The authors use the concept of "Earth carrying capacity" as the Earth has natural and social limits that will pose as danger when the limits are exceeded through continued exponential growth of resource use and waste. Carrying capacity include factors like standard of living, technology, food, water, energy, resources, waste assimilation, disease and war.

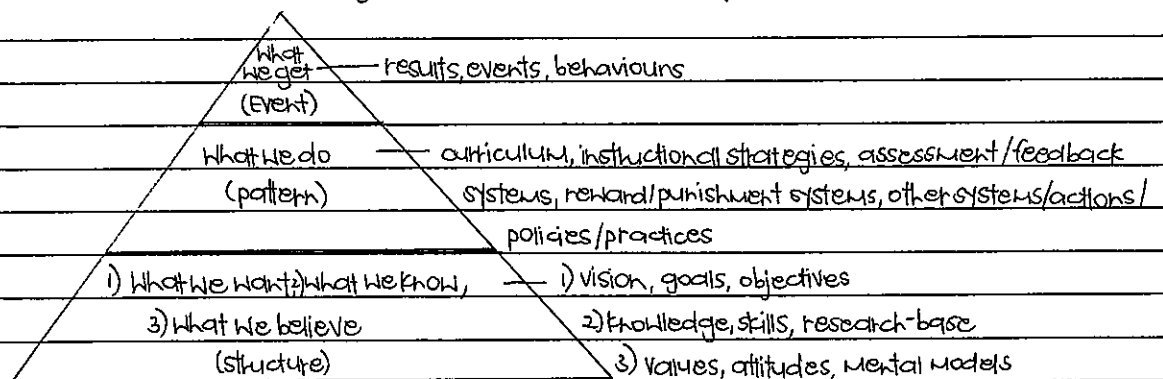
(b) A system is any group of interacting, interdependent, related parts that form a complex and unified whole, that whole having a purpose. A system maintains its existence through the interaction of its parts and is complex, dynamic and inter-dependent.

Systems thinking is the process of understanding how things influence one another within a whole. It is a way of thinking about, and a language for describing and understanding, the forces and interrelationships that shape the behaviour of systems.

The concept of systems thinking is like that of an iceberg analogy. An issue is often presented to us, in the form of events and patterns. To get to the root of any issue, we should uncover the underlying structures which form the patterns and events, that are often only visible to us. This iceberg analogy is illustrated in the figure below.



Using an example to illustrate the concept, we use the idea close to home; our academic achievements. The event is the results that we get (visible), the pattern involves what we do and the structure is our personal character. The following illustration will show the concept clearly.



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(c) The main cause of the series of racial riots that took place in Singapore during 1964 between Chinese and Malay groups is due to the jostling of political power between the two largest ethnic groups. This heightened race sensitivities. Another cause (especially so for the 1969 race riots) would be due to the spillover effect from racial riots in Malaysia. The rumours that spread in Singapore about Malay atrocities against the Chinese in Malaysia aggravated tension in Singapore.

The consequences include the people who got killed and injured during the riots and the damage inflicted on private property and infrastructure when fires were set. These physical consequences also caused further indignance and anger between the two races.

(d) For Singapore, the reasons for merger would be to ease trade barriers and improve economic ties, reduce unemployment, contain communist insurgency, restore emotional ties and gain independence through merger. For Malaysia, their main motivation for merger would be to remove the communist threat at their doorstep.

Singapore was against the merger due to the loss of free port status which was a source of wealth and the loss of control over economic development and education. Malaysia had issues with the merger as there will be too many Chinese.

The reason for subsequent separation of Singapore with Malaysia involved both economic and political reasons. KL saw Singapore as an economic rival and thus, the implementation of a common market was delayed. In retaliation, Singapore did not extend to Sabah and Sarawak the full extent of the loans agreed to for economic development of the two eastern states. Singapore also disagreed to KL's proposal to increase its contribution to central government from 40% to 60% as she feared it will cripple her economy. Moreover, The Alliance did not win a single seat in the 1963 state election in Singapore and the Alliance leaders in KL were upset with the outcome. Alliance leaders also took offence when PAP aimed for equal opportunities for all in the 1964 federal election in Malaysia, as it challenged the rights of the Malays. These conflicting interests eventually led to the separation of Singapore with Malaysia.

4)(a) A few measures were implemented by the Singapore government to steer the country successfully through the recent global recession. The Job Credit Scheme was implemented to subsidise wage costs in a bid to save jobs. A Special Risk Sharing Initiative was also implemented to give companies more access to credit. Personal and corporate taxes were cut so that the workers could be more cost competitive.

The next phase of Singapore's economic growth will be directed towards a global, entrepreneurial and diversified economy. This includes the promotion of new service industries in education, health care and professional services, building strong companies through promoting entrepreneurship, attracting global talent and facilitating economic restructuring through continuous worker education and skills training. In addition, some initiatives include the development of Las Vegas style integrated resorts, growing the service sector in medical, education, professional and tourism services and developing the Biomedical Science cluster across entire value chain of industries.

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(b) The five components of total defence are military defence, economic defence, civil defence, social defence and psychological defence. Military defence serves as a strong deterrent against potential aggressors and to achieve military superiority on first-strike. It involves the modern, well-equipped and coordinated Army, Navy and Air Force with enhanced urban-fighting capabilities. Economic defence ensures that life and economy must go on during hostility and that civilian resources must be mobilisable at short notices. Civil defence involves the protection of major installations and emergency water and food rationing. There are also civil defence drills on safety and evacuation and overseas missions for disaster relief operations to build friendship and sharpen skills and experiences. Social defence is the software of national cohesion, communal tolerance and harmony and building a caring society through compassion, cohesion, community, contribution and commitment. It also involves the tripartite cooperation of the public, private and people sector. Psychological defence is the hardware of will, courage, spirit of oneness, loyalty, commitment, altruism, idealism and patriotism. It is about facing adversity and challenge positively and courageously.

The five "messages" that the National Education programme seeks to convey are: ① Singapore is our homeland and this is where we belong ② Singapore is worth defending. We want to keep our heritage and our way of life ③ Singapore can be defended. United, determined and well prepared shall we fight for the safety of our homes and future of our families and children ④ We must ourselves defend Singapore. No one else is responsible for our security ⑤ We can deter others from attacking us. With Total Defence, we can live in peace.

(c) Singapore is part of ASEAN whose primary concern is regional stability and prosperity. This indicates regional integration and allows Singapore to secure the protection of larger nations. Singapore is also part of APEC which discusses the regional economy, cooperation, trade and investment. Singapore also maintains diplomatic relations with 175 countries. She partakes in resident missions overseas which include 7 high commissions, 18 embassies, 2 permanent representations to the United Nations and 10 consulates. These allow her to maintain good relations with others. Moreover, Singapore has signed many bilateral Foreign Trade Agreements to improve the interdependency between these countries. Besides ASEAN, Singapore belongs to the United Nations, the Non-Aligned Movement, Asia Pacific Economic Cooperation and the World Trade Organisation. These increase Singapore's involvement with global issues and allow her to exercise some influence.

(d) Knowledge was key to restructure both our economy and mindset. In the new economics, knowledge besides land, labour and capital, is the key dynamic. Knowledge is a resource, an intellectual capital that generates wealth. It is the key to Singapore's future as gradually replacing manufacturing with services as the engine of growth, it will be difficult for Singapore to compete in "hard knowledge" but have a comparative advantage in "soft knowledge" such as conceptualizing things. Since Singapore does not have the large quantity of manpower, she has to excel in upstream conceptual and blueprint stage of knowledge. In a knowledge based economy, the defining characteristic of a person is his individual talent and skill and Singapore is providing the necessary environment for the critical mass of talented individuals to make the difference. In addition, infocomm has become a vital pillar of Singapore's knowledge-based digital economy and continues to be an engine of growth.

•the end! happy studying! 😊•

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**NANYANG TECHNOLOGICAL UNIVERSITY****SEMESTER 1 EXAMINATION 2011-2012****CV4000/MP4007/AE4007 – ENGINEERS AND SOCIETY**

November/December 2011

Time Allowed: 2½ hours

**INSTRUCTIONS**

1. This paper contains **FOUR (4)** questions and comprises **SIX (6)** pages.
  2. Answer **Question No.1 (COMPULSORY)** in **SECTION A** and **TWO (2)** other questions in **SECTION B**.
  4. This is a Closed-Book Examination.
  5. The questions do not carry equal marks.
- 

**SECTION A: (COMPULSORY)**

1. For the following ten parts of this question, write down the answer to each part on the first page of your answer book. Indicate your answer in one of the options [(i), (ii), (iii) or (iv)].
  - (a) In which of the following countries whereby steam power was first harnessed for use in machines in the early 17<sup>th</sup> century.
    - (i) England
    - (ii) Germany
    - (iii) France
    - (iv) United States of America

(2 Marks)
  - (b) Which of these safe-exits is least associated with engineering ethics?
    - (i) When a product fails, it will fail safely
    - (ii) When a product fails, it can be abandoned safely
    - (iii) When a product fails, it will not result in great financial loss
    - (iv) When a product fails, the user can safely escape from the product

(2 Marks)

**Note: Question No.1 continues on page 2.**

(c) In November 1991 the constitution of Singapore was amended for an elected President. Which one of the following statements is FALSE:

- (i) The President has powers to safeguard the national reserves.
- (ii) The President has powers to veto appointment to key public offices.
- (iii) Ong Teng Cheong is the first elected President.
- ~~(iv)~~ The President is elected for a term of five years.

(2 Marks)

(d) Singapore has adopted a total defence strategy. Which one of the following statements on its total defence is FALSE:

- (i) Singapore has strong military R&D capabilities, urban fighting capabilities, homeland security and is prepared for civil defence in the event of chemical and biological attacks.
- ~~(ii)~~ Singapore has set aside foreign reserves sufficient for two years of import to support livelihood of the nation during a crisis.
- (iii) There are provisions of civil defence shelters in home estates, MRT stations, medical supplies including blood and emergency water and food rations.
- (iv) The Internal Security Act and Religious Harmony Act have been put in place to ensure harmony in Singapore's multi-racial, multi-religious and multi-cultural society.

(2 Marks)

(e) ASEAN was founded in 1967. Besides Malaysia and Singapore, the other three original members were:

- (i) Brunei, Indonesia and Philippines.
- ~~(ii)~~ Indonesia, Thailand and Philippines.
- (iii) Brunei, Thailand and Philippines.
- (iv) Indonesia, Thailand and Vietnam.

(2 Marks)

(f) Which one of the following statements concerning the International Monetary Fund and the World Bank is FALSE:

- (i) The President of the World Bank is appointed by the President of the USA.
- (ii) The USA has effective veto powers in the International Monetary Fund.
- ~~(iii)~~ The President of the World Bank is elected by members of the World Trade Organisation.
- (iv) The Chief of the International Monetary Fund has, since its inception after the end of World War II, always come from a European country.

(2 Marks)

Note: Question No.1 continues on page 3.

(g) In 1954, the Legislative Assembly was set up as the new form of government in Singapore. David Marshall became the 1<sup>st</sup> Chief Minister of Singapore. Who succeeded him later?

- (i) Lee Kuan Yew
- (ii) Devan Nair
- ~~(iii)~~ Lim Yew Hock
- (iv) Yusof bin Ishak

(2 Marks)

(h) There was a referendum held in Singapore for the following purpose:

- (i) To decide on making request to the British for full self government
- (ii) To decide on the new constitution for the Republic of Singapore
- (iii) Introduction of the Presidency to become a popularly-elected office
- ~~(iv)~~ To decide on the merger and the island's position within the Federation of Malaysia

(2 Marks)

(i) In the concept of sustainable development, the two critical functions that an organism's survival depends on from its environment are:

- (i) Provision of an ecosystem and ensuring sustainable development
- ~~(ii)~~ Provision of resources and absorption of wastes
- (iii) Provision of photosynthesis and nutrients
- (iv) Provision of air and water

(2 Marks)

(j) The "Triple Bottom Line" approach of sustainability refers to:

- (i) Bearability, equitability and viability
- (ii) Profit, people and nation
- (iii) GDP, foreign direct investment and competitive advantage
- ~~(iv)~~ Economy, society and environment

(2 Marks)

**SECTION B: [ANSWER ANY TWO (2) QUESTIONS]**

2. (a) The decline of Britain's industrial leadership in the middle of 19<sup>th</sup> century onwards had led to the successful gain of industrial prominence of countries like Germany, France and the United States. Discuss briefly some of the events that led to such rapid rise in industrialization of these countries.  
(10 Marks)
- (b) Briefly discuss the various strategies adopted by the Singapore Government to strengthen the technological capabilities of companies operating in Singapore to survive the fierce competition coming from abroad.  
(10 Marks)
- (c) Discuss three lessons in the area of safety we can learn from the sinking of Titanic on 12 April 1912.  
(10 Marks)
- (d) Your manager is contemplating bribing the CEO of a company in order to get a big order. Use any two of the ethical theories (separately) to convince him that bribery to get the contract is an unethical act.  
(10 Marks)

3. (a) Briefly describe the evolution of the Office of the President in Singapore since independence. What are the major roles of the President under the Constitution? Highlight the major contributions of a past President of Singapore.
- (10 Marks)
- (b) What is "Operation Coldstore"? Explain the background that led to "Operation Coldstore". How has this event affected Singapore's political development in the early years of nation building?
- (10 Marks)
- (c) The "Club of Rome Report: Limits to Growth" was published in 1972 and "Limits to Growth: The 30-year Update" in 2004. Briefly describe the main conclusions of these two reports. Explain the argument of the authors using the concept of "Earth Carrying Capacity". Give two simple suggestions on how human can change its destiny to avoid the scenario as predicted by the "Club of Rome Report".
- (10 Marks)
- (d) What is a system? What is "systems thinking"? Illustrate your explanation on "systems thinking" using the "Iceberg" analogy.
- How can "systems thinking" be used to solve sustainable development issues? Elaborate your answer with a real life example.
- (10 Marks)

4. (a) Singapore has been governed by a single party since its independence in 1965. The strong leadership and political stability have enabled the government to adopt long-term solutions and sustainable policies rather than short-term popular ones. Five principles founded on strong values and beliefs guided their choices in governance. Discuss these five principles.  
(10 Marks)
- (b) What are the five components of Singapore's total defence strategy? Discuss psychological defence and how Singapore can build up this aspect of its defence.  
(10 Marks)
- (c) China has been the economic superstar of recent years. With its double-digit annual growth it has become the world's second largest economy and in many ways the most dynamic. However its future is fraught with dangers. Discuss some of the factors that can derail China's progress.  
(10 Marks)
- (d) As economic interdependence continues to gather the people of the world into a single community, it brings with it the need to think and act globally. Discuss some of the pressing economic, social and environmental challenges brought about by globalization.  
(10 Marks)

**END OF PAPER**



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|--|
| MP 4007 Engineering and Society  |
| November/December 2011   |
| Section A: (a) (i)   |
| (b) (iv)   |
| (c) (iv)   |
| (d) (ii)   |
| (e) (ii)   |
| (f) (iii)  |
| (g) (iii)  |
| (h) (iv)   |
| (i) (ii)   |
| (j) (i)  |
| Section B  |
| 2.(a) There are some of the events that led to the rapid rise in the industrialization of Germany, France and the United State. For example:   |
| 1. In US, manufacturing replaced agriculture as the leading source of economic growth. Manufacturing Industry was itself transformed –manufacturers shifted to produce products for consumers to producers. Heavy Industry such as steel, iron, petroleum & machinery grew rapidly, boosted by a number of technical innovations. Price of raw materials fell-stimulated new demands and further technological changes.  |
| US military academy at west point, established in 1802, the first American military engineering school.  |
| US universities was forced to introduce technical courses.   |
| 2. In Germany, industrialization drives push to expand foreign trade in the export of industrial products. Germany government strongly promoted education relevant to industrialization. And manufacturers set up Closely integrated industrial research laboratories. By 1900. Germany had surpassed Britain as an industrial Power, especially in the field of university-level technical expertise. Germany established Berlin University in 1809 and the first polytechnics in 1825. |
| 3. In 1676, France set up a special army corps of engineers. In 1747, France established the first Engineering school and in 1794, the Ecole Polytechnique was established.  |
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2(b) Economic development strategies –Singapore develops a strong capability in manufacturing, services, And good supporting infrastructure, such as telecommunications, utilities and port services. Due to the lack of Natural resources and a small population, Singapore try to maintain its economic competitiveness to move to An innovation phase of the development and promote activities with more innovative and design content

Singapore also ensures its future’s research, innovation and technological development. Singapore must increase Her capacity to undertake research and development of international standard.

Develop science and technology capabilities to support the upgrading and restructuring of Singapore’s existing Industry and business clusters. Enable Singapore to continue to serve as a highly competitive industry and Business hub in the region. Singapore will try to become an industry and business blusters that are sufficiently Strong to serve as anchors to enable the economy to perform well.

2(c) Lesson 1: conduct proper safety drill

There is no drill on evacuation using lifeboats. In an atmosphere of confusion and chaos, women and Children were loaded onto lifeboats. Unfortunately, without an understanding of and experience with lifeboat Procedures, “the lifeboats were only partially loaded before being lowered to the sea”. Designed to carry up to 65 Passengers some left with only a dozen people on board.

Lesson 2: proper procedure has to be followed

It was the policy of sea captains at that time to maintain full speed until they have spotted the ice and slow Down only when it became absolutely necessary. In the case of titanic, the crew was well aware, because of Wireless messages, that the ice lay ahead, but it was because it was the way it was always does that they Proceeded at full speed toward the ice field. In the case of titanic such practice was dangerous because it was Too big to slow down or to change direction in time and the crew had no experience how to maneuver the new Big ship.

Lesson 3: Provide for means of safe exit

Insufficient number of lifeboats was provided. titanic carried only 20 lifeboats which meant that there was Provision for only 52% of the people on board although it was possible to carry 48 lifeboats which would have Been sufficient for all aboard. The law at that time only required 16 lifeboats to be carried.

2(d) this is a very open-ended question. Use any 2 ethical theories, for example virtue ethics and self-realization Ethics to elaborate as long as your explanation convincible. Better if you can give examples to demonstrate Bribery is an unethical act.

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|   |
|---|
| 3(a) since independence, the constitution allows the election of a President by the citizens of Singaporean.  |
| The elected President will hold office for a fixed term of six years. There are no term limits to the presidency.   |
|   |
| The president, who is elected and possesses veto powers, provides a check on a Government that misuses the Nation's financial reserves, or undermine the integrity of the civil service by making appointments out of Favoritism. The President is elected by the people to ensure that he would have the necessary mandate to carry Out that custodial role.   |
|   |
| The president's powers include a further check on government proposal to detain persons under the Internal Security Act and to issue restraining orders under the Maintenance of Religious Harmony Act. The president's Veto powers over the government are focused on specific areas: (a) protection of past reserves; (b) appointment Of key personnel and (c) ISA detentions, CPIB Investigations and any restraining order in connection with the Maintenance of religious harmony.   |
|   |
| One of the past elected president: Ong Teng Cheong  |
| Contributions: 1. Ong pushed for the development of the Changi Airport and Mass Rapid Transit System, the Largest construction project in Singapore's history   |
| 2. He came on the labour front when he became the secretary-general of NTUC in 1983.  |
| 3. Involved in many charitable projects, which touched the lives of many Singaporeans.  |
|   |
|   |
| 3(b) Operation Cold store was a security operation launched in Singapore on 2 Feb 1963 in which at least 111 Anti-government left-wing activists were arrested and detained, including key members of the opposition Political party Barisan Sosialis. Others arrested included newspaper editors, trade unionists and university Students. The operation, authorized by the Internal Security Council which comprised representatives from the British Colonial, Malaysian Federal and Singapore governments, was touted as an anti-Communist sting. |
|   |
| Malaya had a strong anti-communist policy. During the Malayan Emergency, Malaya managed to contain Communist influence. However, the communists had substantial influence in Singapore. Fearing a communist Resurgency, the Malayan Prime Minister Tengku Abdul Rahman insisted that Singapore round up all pro-Communists before the merger occurred.  |
|   |
| The operation dealt a heavy blow to the Barisan Sosialis, just months before the 1963 general elections. SATU was deregistered after its leaders were arrested, and the NTUC became the main trade union in Singapore Ever since. NTUC remains closely associated with the PAP, with many of its union leaders being PAP's Members of parliament.   |
|   |
|   |
|   |
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|   |

3(c) The Limit to Growth report 1972, studies the consequences of continued unabated resource use, modeling the "world system" up to 2100. The purpose of the Limit to Growth was not to make specific predictions, but to explore how exponential growth interacts with finite resources.

The main conclusion to the "Limit to Growth" is that if the present growth trends in world population, industrialization, pollution, food production, and resource depletion continue unchanged, the limits to growth on this planet will be reached sometime within the next one hundred years. The most probable result will be a rather sudden and uncontrollable decline in both population and industrial capacity.

Limits to Growth: the 30-year update conclusion in 2004 concludes that since 1972 there have not been any significant changes in the policies that drive growth in population and industrial production. Now the use of resources and generation of pollution are above sustainable levels.

In 1972 the challenge was to slow down, now the challenge is to get back down. Decline is still the most probable future, and now it is much more likely-but not inevitable. But thirty years have been lost, and the period of declining growth-chosen by us or enforced by the planet- is thus much closer.

For the "earth carrying capacity", necessary to include the diagram in the notes.

3(d) System is any group of interacting, interdependent, related parts that form a complex and unified whole, that whole having a purpose. A system maintains its existence through the interaction of its parts. Systems are complex, dynamic and inter-dependent.

#### Systems thinking- iceberg analogy

An issue is often presented to us, in the form of events and patterns. To get the root of any issue, we should uncover the underlying structures which form the patterns and events that are often only visible to us.

"Event" – an event is an occurrence at some moment in time, human beings tend to hang up on events rather than their causes or how they fit into a larger pattern. We cannot continue to react to events, rather we must anticipate and shape them. Solutions that address events are short-lived because they do not address the fundamental structure that caused the event.

"Patterns" – changes in events over time. Patterns allow us to understand the systemic structure that drives that pattern. In a pattern, we begin to see how a series of events are inter-related and begin thinking about what caused them.

"Structure" – the way system components are inter-related, i.e. the organization of a system. A system's structure gives rise to event and pattern. Although systems are built on structures, they are invisible.

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|  |
|--|
| 4(a) 5 principles of success   |
| 1. Meritocracy: it is described as one of Singapore's official guiding principles for domestic public policy Formulation; people are rewarded based on their personal achievements, with no regard to their ethnicity or Background. Singapore is based on justice and equality so as to achieve a prosperity and progress for the nation.   |
| 2. Multi-racialism is regarded by the government as a crucial part of Singapore's success and played a part In building a Singaporean identity. Due to the many races and cultures in the country, there is no single set of Culturally acceptable behaviors. This culture behavior helps to attract people around the world to come here And settle down, increase population and economic growth eventually. |
| 3. Singapore has anti-corruption system, we value integrity, and more importantly, we have a sense of Belonging and true serving heart for the society. Formed as a one united nation, that is one of the key factors Why Singapore prosperous.  |
| 4. Pragmatism- government strongly believes in the effectiveness of results-based management and takes A whole-of-government approach to performance management that ensures resources and budget are aligned With national goals and priorities.  |
| 5. Market forces   |
| 4(b) Five components of total defence strategy: social defence, psychology defence, civil defence, military Defence and economic defence.  |
| Psychological defence:   |
| (1) it is the most difficult, take generations to build  |
| (2) Will and courage, spirit of oneness, loyalty and commitment  |
| (3) Know what and why we are fighting for  |
| (4) Not about pragmatism, but altruism, idealism and patriotism  |
| (5) About building self-confidence(Mt Everest Quest & Antarctica 2000, singapore women's Everest team 2009; same for the Chinese in hosting Olympic 2008 at Beijing & world Expo 2010)   |
| (6) About risking life to protect integrity and sovereignty of Singapore   |
| Therefore, we should beef up psychological defence by:   |
| • Set up NE for all-citizens   |
| • Tripartite participation in security exercise  |
| • Heighten threat through mass media/publicity   |
| • Undertake more social and community programs to foster greater sense of psychological  |
| • Awareness and national wellbeing   |
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4(c) Factors that affect china's progress:

1. China faces increasing urbanization; at present 30-35% of the 1.3 billion Chinese live in small towns Cities. By 2050 they will be 80%, over the next two decades china will build 20,000 to 50,000 new skyscrapers, And more than 170 cities will require mass transit systems by 2025.

2. Widening difference in incomes and poverty has been the main obstacles of china's growth. Unequal Income distribution pattern encourages corruption and injustice, intensifies social conflicts. To make the Virtuous circle of economic growth and impartial income distribution has been the important task for china.

3. China has to settle sensitive issue of Taiwan-any miscalculation by the two parties could bring about A conflict that will have disastrous consequences in the region. Hopefully the status quo is unchanged and the Eventual reunification becomes a reality

4. There are problems between Han and minority races in Tibet, Xinjiang and Qinghai. Those problems Will definitely cause internal conflicts, which is not healthy for china's growth.

5. Due to the combination of the one child policy and a preference for male children over females, there Is shortfall of girls. This is going to lead either to a lot of frustrated men in the future or a large influx of foreign Brides (or maybe both). The one child policy continuously raised as an issue, and aging population will continue Be a long term problem for china.

4(d)

Recent fast unexpected economic changes with insufficient control cause disruptions, sufferings, dislocations, Sufferings, unemployment, etc. both rich and poor countries are not spared, with many poor countries get even Poorer and hit by bad debts. But protests from rich countries attract more attention from the media. These Protesters identified globalization or global capitalism as their target. Some basic issues cannot be solved Easily.

The speed and scale of economic change has made it increasingly difficult for governments to keep their Economic destiny in their own hands. And what is most disturbing for many people is that no-one seems to be in Charge, or be able to agree fair rules for the new global economic order.

The international institutions meant to deal with the globalizing world are all in trouble. For example, the world Trade organization is now under fire for failing to take into account labour standards or the environmental impact Of trade. And its efforts to break down global trade barriers are faltering.

Meanwhile, the international monetary fund(IMF) and the world bank, set up in 1944 as part of the UN system To run the international monetary system and to co-ordinate aid flows to poor countries, have come under Criticism for not giving a bigger role to emerging market countries like india and china. And the IMF has found It increasingly difficult to influence the world's capital markets, whose huge financial flows dwarf its resources- Or to correct the huge global imbalances that arise from trade.

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**NANYANG TECHNOLOGICAL UNIVERSITY**

**SEMESTER 1 EXAMINATION 2012-2013**

**MP4007/AE4007 – ENGINEERS AND SOCIETY**

November/December 2012

Time Allowed: 2½ hours

**INSTRUCTIONS**

1. This paper contains **FOUR (4)** questions and comprises **FIVE (5)** pages.
  2. Answer **Question 1 (COMPULSORY)** in **SECTION A** and **TWO (2)** other questions in **SECTION B**.
  3. This is a **CLOSED BOOK** examination.
  4. The questions do not carry equal marks.
- 

**SECTION A: (COMPULSORY)**

1. For the following ten parts of this question, write down the answer to each part on the first page of your answer book. Indicate your answer in one of the options [(i), (ii), (iii) or (iv).]
  - (a) In 1954, the Legislative Assembly was set up as the new form of government in Singapore. Who became the 1<sup>st</sup> Chief Minister of Singapore then?
    - (i) Lim Yew Hock
    - (ii) Lee Kuan Yew
    - (iii) Stamford Raffles
    - (iv) David Marshall

(2 marks)
  - (b) There was a referendum held in Singapore for the following purpose:
    - (i) To decide on making request to the British for full self government.
    - (ii) Introduction of the Presidency to become a popularly-elected office.
    - (iii) To decide on the merger and the island's position within the Federation of Malaysia.
    - (iv) To decide on the new constitution for the Republic of Singapore.

(2 marks)

Note: Question 1 continues on page 2.

- (c) Engineering Ethics is about:
- (i) A code or system of rules defining moral behavior for engineering profession.
  - (ii) A set of rules on acceptable personal behavior and courtesy when interacting with others in a social setting.
  - (iii) A system of rules and punishments clearly defined and established by government to maintain a safe and orderly social environment.
  - (iv) A set of personal rules of right and wrong behavior derived from a person's upbringing, religious beliefs, and societal influences.
- (2 marks)
- (d) Ethical problems have the following characteristics:
- (i) These problems have a correct answer that will be arrived to by everyone.
  - (ii) Ethical problems are open-ended and there is no formula for an answer.
  - (iii) If something is legal, it must mean it is ethical.
  - (iv) Violations carry penalties by relevant authority.
- (2 marks)
- (e) "Agenda 21" is a report by:
- (i) The Club of Rome.
  - (ii) The Brundtland Commission.
  - (iii) The Rio Earth Summit in 1992.
  - (iv) The World Summit on Sustainable Development in 2002.
- (2 marks)
- (f) Singapore is **not** a member of which of these international organizations?
- (i) Asia Pacific Economic Cooperation (APEC).
  - (ii) World Trade Organization (WTO).
  - (iii) Non-Aligned Movement (NAM).
  - (iv) None of the above.
- (2 marks)
- (g) What did the Fall of the Berlin Wall signify?
- (i) The End of Cold Wall
  - (ii) Reunification of West Germany and East Germany
  - (iii) Globalization of world economy
  - (iv) None of the above
- (2 marks)

Note: Question 1 continues on page 3.



(h) Singapore practiced Import Substitution model in her economic development during the period 1959 to 1965. Which of the following statements is **not** correct?

- (i) Tax incentives such as Pioneer Status were granted to labour intensive industries.
- (ii) Unemployment rate was more than 13% in 1959, but dropped to less than 10% in 1965.
- (iii) Protectionist policies using tariffs to shield local industries from foreign competition.
- (iv) None of the above.

(2 marks)

(i) Which of the following components of Total Defence is most intangible?

- (i) Social Defence
- (ii) Economic Defence
- (iii) Psychological Defence
- (iv) Military Defence

(2 marks)

(j) Which of the following actions is **not** compatible with knowledge-based economy?

- (i) Strengthen and broaden the overall education of its people so that they can be more adaptable and flexible in facing global competition.
- (ii) Nurture the spirit of entrepreneurship and build a technopreneur society.
- (iii) Learn to think (outside the box) rather than just learn to carry out instructions.
- (iv) None of the above.

(2 marks)

**SECTION B (ANSWER ANY TWO (2) QUESTIONS)**

- 2(a) One of the problems Singapore faced after the Japanese invasion was communism. Describe communism activities during this period using one key event to illustrate how it has impacted on the lives of Singaporeans  
(10 marks)
- (b) Singapore faced a serious problem of housing shortage shortly after independence, how did the government resolve this important social issue.  
(10 marks)
- (c) How important are ethics in today's society? State and explain one of the Rules of Practice for engineers to illustrate your discussion.  
(10 marks)
- (d) What was the cause of the collapse of Nicoll Highway MRT worksite in 2004? What we as engineers could have done?  
(10 marks)
- 3(a) Name **two** of the significant Japanese investments and discuss how each of them contributed greatly to Singapore's industrial development.  
(10 marks)
- (b) Ngiam Tong Dow is one of Singapore great economic movers/shakers and thinkers. Discuss **two** of his ideas on how Singapore can excel in the new world economy.  
(10 marks)
- (c) Discuss **three** of the measures known as "Resilience Package" that Singapore embarked on during the economic recession in 2009.  
(10 marks)
- (d) What are **two** of the main thrusts of social defence?  
(10 marks)

- 4(a) Describe how business behaviour on sustainability issues is evolving. What is the meaning of "Triple Bottom Line"?  
(10 marks)
- (b) What are the four "system conditions" of "The Natural Step"? Using examples to explain the application of these "system conditions"?  
(10 marks)
- (c) Discuss **two** actions that Bismarck took that contributed to the rise of Germany.  
(10 marks)
- (d) Discuss **three** reasons the development of science and technology capabilities contribute towards the Singapore's economic development.  
(10 marks)

**END OF PAPER**



Semester 1 2012/2013.

Section A:

- |        |        |
|--------|--------|
| 1a) iv | f) iv  |
| b) iii | g) i   |
| c) i   | h) ii  |
| d) ii  | i) iii |
| e) iii | j) iv  |

Section B:

2a) After the Japanese invasion, the communists took advantage of the post-war problems and started to stir up the people's feelings against the British. The communists were able to make use of the students in Chinese schools as they were not under government control. Furthermore, the Chinese school students were unhappy with the British government because they were not given equal opportunities for the entrance to the university. They could not get well-paid jobs when they graduate. This led to riots in many parts of the city.

One of the riots was the Hock Lee bus riots that occurred on May 12, 1955. The people involved were members of the Singapore Bus Workers' Union (SBWU) and they were protesting against poor working conditions, long working hours and low pay. They also felt threatened by a rival union which was supported by the bus company to counter any labour action by SBWU. The strikers stopped buses from leaving the depots and crippled the city's entire transport system. The police attempted to disperse the picketers, injuring 15 people. This gained more public sympathy and support for the strikers. This riot resulted in 4 deaths and 31 injured people.

The other riot was the Chinese Middle Schools Riots which resulted in 13 people killed and more than 100 injured. This started when Lim Yew Hock replaced David Marshall as Chief Minister of Singapore as he took tough measures to suppress communist activities by deregistering and banning two pro-communist organizations: the Singapore Women's Association (SWA) and the Chinese Musical Gong Society. The Singapore Chinese Middle School Students Union (SCMSSU) was also dissolved. In protest, students gathered and camped at Chung Cheng High School and the Chinese High School. Meetings and demonstrations were held. The government issued an ultimatum that the schools be vacated and as the deadline approached, riots started.

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P. (1)

2b) In response to housing shortage problem, the government passed the Housing and Development Act of 1960 which replaced the existing Singapore Improvement Trust with the Housing and Development Board. Led by Lim Kim San, its first priority during formation was to build as many low-cost housing units as possible, and the Five-Year Plan was introduced. It was mostly meant for rental by the low income group. The Home Ownership for the People Scheme was introduced to help this group of people to buy instead of rent their flats. While this new scheme acted as a hedge against inflation, it provided the home owners financial security. Later, the people were allowed to use their Central Provident Fund money for downpayment. A total of 54,400 housing units were built between 1960-1965.

2c) Ethics are very important and placed on professionals as they provide services or make judgements that are not easily understood by the general public due to the high technical nature. The trust in them imposes responsibilities on the professionals. One of the Rules of Practice is that engineers shall hold paramount the safety, health, and welfare of the public. This principle overrides all other considerations. If engineers' judgement is overruled under circumstances that endanger life or property, they shall notify their employer or client and such other authority as may be appropriate. They shall approve only those engineering documents that are in conformity with applicable standards. They shall not reveal facts, data or information without the prior consent of client or employer except as authorized or required by law or this code. They shall not permit the use of their name or associate in business ventures with any person or firm that they believe are engaged in fraudulent or dishonest enterprise.

2d) The main cause of the collapse was due to two critical design errors. The first being the under-design of the diaphragm wall using Method A. Finite element analysis of ground conditions used the mechanical properties of drained soils (Method A) when data for undrained soils should be used. The second was the under-design of the walter connection in the strutting system. There was about 10% underestimation of strut loads at level 9; 50% underestimation of wall bending moments and 50% underestimation of wall deflections. The collapse was also due to the negligence acts of Shun Sugawara (Project Director), Paul Broome (Project Co-ordinator), Kazuo Shimada (Project Co-ordinator) & Ng Seng Young (Project Director from LTA).

As engineers, we must ensure things are done within requirements of the law, have effective risk management, check robustness of design, ensure independent checks by external parties, monitor instrument readings frequently, and always keep in mind that safety is above all else.

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3a) In the early 1960s, Maruzen Toyo, an oil trading company, built a modest oil refinery in Pasir Panjang estuary. Shell, Esso and Mobil followed soon after, making Singapore an international refining, petrochemical and oil trading centre.

In 1975, Sumitomo Chemical of Japan proposed to build a modern petrochemical complex on Pulau Ayer Merbau but it only got going in 1983 after Iran-Iraq war broke out, causing Mitsui to abandon their half completed petrochemical complex in Iran. Petrochemical Corporation of Singapore (PCS) invested in a 50:50 joint venture investment of US\$1 billion and later sold it to Shell. Without PCS, there would be no Jurong Petrochemical Island which we are proud of today.

3b) Ngiam Tong Dow discussed that in the new economics, knowledge, besides land, labour and capital, is the key dynamic. Knowledge is a resource, as intellectual capital generates wealth. With the application of knowledge, output can be increased beyond the potential of the three classical factors of production. It would be difficult for us to compete in 'hard knowledge' but we have comparative advantage in 'soft knowledge' such as conceptualizing things. In addition, for us, the competition is between cities and not countries. There is a need for critical mass of talented individuals to make a difference. We need to provide space for creativity in schools and to attract talented people to join us, as well as retain our own talent. In a knowledge-based economy, the defining characteristic of a person is his individual talent and skill, not his citizenship, race or creed. We need to create a suitable environment for these talents from all over the countries to work, live & play in Singapore. At the same time, we must encourage our own talents to remain and those who are abroad to return by appealing to their hearts and not just their minds.

3c) The 'Resilience Package' was the immediate economic measures carried out. One of the measures in this package was to introduce the Job Credit Scheme. This was aimed to save jobs by giving direct cash grant to subsidize wage bill. The second measure was to provide loans for businesses with a Special Risk-sharing Initiative and a new Bridging Loan Programme to meet working capital needs of mid-sized companies. Investment for the Future was another measure by increasing spending on infrastructure such as roads, MRT networks, HDB upgradings and other sustainable development projects.

3d) The main thrusts of Social Defence are national cohesion and internal security. Social Defence is the social glue that binds people together. For a multi-racial, multi-religious society like Singapore, national cohesion, communal tolerance and harmony are vital and necessary. Internal Security Act and Religious Harmony Act were introduced to safeguard internal security in Singapore. It is important to build a caring society through the 5Cs, compassion, cohesion, community, contribution and commitment. Furthermore, there is a need to inculcate care-giving since young, caring for the aged & sick, manage & integrate the new immigrants, & ensure tripartite cooperation of public, private and people (3Ps) sector for social cohesion.

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4a) Back in 1940s, business behaviour on sustainability issues was ignorance. Slowly, it evolved to denial/confrontation then compliance in 1975. In 1985, it became beyond compliance and finally to partnerships for sustainability.

The 'Triple Bottom Line' consists of Economic, Environmental and Social Factor. Under the Economic approach, the aim is to maximize income while maintaining constant or increasing stock of capital. Under the Environmental approach, it is to maintain resilience and robustness of biological and physical system. Finally, under the Social approach, it is to maintain the stability of social and cultural system.

4b) In a sustainable society, nature is not subjected to systematically increasing concentrations of substances extracted from the Earth's crust, concentrations of substances produced by society & degradation by physical means and in that society, people are not subjected to conditions that systematically undermine their capacity to meet their needs. For example, oil extractions from the earth's crust, pollution caused by factory wastes, deforestation and being unable to obtain food from the environment.

4c) Bismarck created state-owned national railway to open up internal market and push to expand foreign trade in the export of industrial products. The German government helped by strongly promoted education relevant to industrialization. Closely integrated industrial research laboratories were also set up. These led to the rise of Germany.

4d) The development of science and technology capabilities will support the upgrading and restructuring of Singapore's existing industry and business clusters. It can support in the manufacturing sector, from low value-added assembly activities to those with higher innovation and technological content. It can enhance Singapore's attractiveness to the multi-national corporations (MNCs) and encourage them to root their operations here in Singapore. It can also enhance the competitiveness of the local small and medium enterprises (SMEs) as well as firms in the services sector to enable them to develop and compete not only regionally but also globally. On the whole, Singapore needs a few prominent industry and business clusters that are sufficiently strong to serve as anchors to enable the economy to perform well. Hence, Singapore must possess world class capabilities in innovation, technology and human resources in order to position these clusters as world leaders.

GOOD LUCK! ☺

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