

**NANYANG TECHNOLOGICAL UNIVERSITY****SEMESTER 1 EXAMINATION 2010-2011****CV4000/MP4007/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.

(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

M	L
I	V
S	C
T	B
P	M?

(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.

(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 × - employer
- (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 × - employer

(2 Marks)

**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)

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.

*re-market  
re-think  
re-visualize  
re-engineers* Nokia, WX Lupo. (10 Marks)

- (d) What is systems thinking? What is a system? Explain how the approach can be adopted for sustainable development.

(10 Marks)

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

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.



B9 0)

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 (3)

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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Pg. (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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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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