The University of South Australia

School of Natural & Built Environments

Professional Engineering Practice
ENGG 2001 – [10833]

EXAMINATION

Semester 1, 2005

Reading Time:- 10 minutes
Time to write the exam:- 3 hours

OPEN BOOK

Instructions

- **The examination contains 4 sections (Sections A to D)**
  - **Section A, 27%, Safety Engineering**
  - **Section B, 19%, Engineering Management**
  - **Section C, 27%, Business Management**
  - **Section D, 27%, Engineering Finance**
- **Write your answers to sections A - D in separate books**
- **Attempt all 4 sections**
- **Instructions for each section are given at the top of the first page of each section. Read these instructions carefully.**
- **You may use calculators and dictionaries**

Section A
(Mr. Barrie Collison) Safety Engineering

You are advised to spend 48 minutes on this section

There are 4 questions to this section you must attempt all 4

The questions have different values as indicated.

The total section is worth 40 marks.

Q1. Safety Culture

In the Longford Gas Explosion that killed 2 men, injured 8 others & crippled Victoria's industry for 2 weeks in 1998, the findings of the inquiry stated:-

- Risk management was inadequate
- Operating standards, policies & procedures not enforced
- Lack of incident reporting.

All contributed to the serious outcomes of the incident.

A Safety Culture is encouraged & developed in successful organizations.

Where on a scale of 1-10, would you rank Esso's performance in this area that impacted so disastrously in the above incident?
(You must explain the Why? of your adjudication)

Q2. Accident Investigation

The investigation of accidents is critical to the prevention of their re-occurrence.

A taxonomy is a tool often used to analyze accident statistics that relate to a particular industry, thus giving a guide to the number & type of accident in that industry.

Within a particular entity/organisation it is not likely that data as extensive as a taxonomy will exist.
It is then for management to identify their 'Hot Twenty'

- Explain what you understand by the 'Hot Twenty'?
- How would you identify them?
- Explain how you would categorize accidents. So as to give a guide to which causes you would tackle first.
- List accident investigation models you know off that have been developed to investigate accidents & near misses?

Q3. Hazard Management & Control

- Describe what you understand is the difference between a Hazard & a Risk
- List types of hazards that exist.
- Under each of the hazard types nominate a specific hazard that you may be exposed to.
- How would you determine the level of risk that exposure to such a hazard is determined.
- List the hierarchy of control measures recommended in controlling your evaluated risk.

Q4. Hazard Identification

- Dust exposure in the workplace may impact on your respiratory system. What dust diseases come under the heading pneumoconiosis?
- For the dust to penetrate deep into the respiratory system of the Bronchus & the Alveoli, what needs to be the size range? & would it be visible to the naked eye?
- Noise exposures in industry may be excessive & produce noise induced hearing loss, what exposures over an 8 hr day are acceptable to prevent the majority of the workforce from suffering noise induced hearing loss.
- Working in a confined space would require that you test among other things a safe level of oxygen in the atmosphere, what range of oxygen levels is considered acceptable?
- Exposure to hazardous substances may impact on the body via what pathways?
- What documentation is essential in providing the workforce with information re the handling, transport, storage etc of hazardous substances.
- What information does this Hazchem code provide to emergency service personnel

2XE

Section B
(Mr. Don Cameron) Engineering Management

You are advised to spend approximately 36 minutes on this section

There are three questions you must attempt all three

The questions have equal values

The total section is worth 30 marks.

Question 1 **[10]**

What are the basic principles behind IEAust's Code of Ethics? Discuss why ethics are necessary and why judgement may be needed to resolve some ethical situations. Use examples if you can.

Question 2 **[10]**

The recent push towards sustainable development has suggested better future practices, in terms of social, economic and resource sustainability. Business leaders have acknowledged that sustainable development makes good business sense. Discuss the reasoning behind sustainable development, how it is affecting engineering and why it may be good for business, providing examples of new developments or practices, where possible.

Question 3 **[10]**

Globalization is a fact of life for Australians and most other nations. There are undoubtedly benefits from this process, however concerns over unrestricted globalization exist. Explain the root causes of these concerns and some of the measures that may be taken to make globalization fairer to all.

Section C
(Mr. Chris Martin) Business Management

You are advised to spend approximately 48 minutes on this section

The question is in two parts. Both parts of the question are of equal value.

You should read the case study below then answer the two questions underneath the case study.

The total section is worth 40 marks.

Case Study:-

LightSquare building and construction company is a Melbourne based construction and development company with offices in Sydney, Brisbane, Adelaide and Perth. It also operates some construction projects on the Gold Coast in Queensland out of its Brisbane offices.

The company covers three distinct markets viz (1) civil works covering bridges, pipelines and production platforms for the oil and gas industries (2) high rise commercial buildings –the fastest growing sector-especially in Perth and Brisbane, and (3) large construction projects in the residential building sector which required specialist project development skills. The company has made a name for itself over the last decade by forming strategic alliances with other parties where it has a weakness itself, viz. in project financing, and project development. These alliances have proved very profitable in the past but need careful planning and on-going efforts.

The Melbourne head office of LightSquare has over 300 staff covering state based divisional managers, project managers, and project engineers. Construction administration staff covers administrators and site clerks. Another 150 staff are located on the many construction sites around Australia. Unlike other construction companies, LightSquare places all administrative and clerical staff on each building site that is linked by on-line real time budgetary systems for each project with head office staff in Melbourne. These staff report separately to state-based administrative managers. Total construction turnover last year was $80m with profits of $6.4m. This was $1m more than last year but lower than the year before. It is early days yet but the Finance Director expects profits for the forthcoming year to be in line with last years results ie around $6.0- $6.5 million. However within those profit figures were disturbing fluctuations with some projects returning 18% return on investment and others 2% return on investment. The Finance manager stated recently that if it had not been for money market operations the results would have been worse.

LightSquare has identified that the mining industry in Australia was undergoing extraordinary growth and presented big opportunities for profit growth but LightSquare had no expertise in the area and no staff. And the remoteness of industry projects itself had big challenges for a construction company, particularly in staffing. In addition, there was a worldwide shortage of Hammerhead cranes. However with China's economy booming and likely to continue so, this trend seemed a long-term opportunity for LightSquare. But CEO Dave Goodman had two concerns. Was LightSquare positioned well enough to enter the mining industry given its current state-based organisational structure? And why were financial results so variable? What was holding back the company from reaching its potential, he thought. What was he to do?

Part A [20]

What is the optimum organisational structure for LightSquare Building and Construction to adopt in order to achieve superior profits bearing in mind its multi-sector client base and the geographical spread of its operations?

(You should argue why the choice you made is superior over other design options)

Part B [20]

What *management* tools or techniques are open to LightSquare Building and Construction to enhance the consistency of its operational and financial results and how would you imagine these tools working in practice?

Section A
(Dr. Anthony Meyers) Engineering Finance

You are advised to spend approximately 48 minutes on this section

There are 11 questions to this section you must attempt them all.

The question parts have different values as indicated.

You may answer this section on the paper if so please ensure you insert your name & ID on every page & hand them up with your booklet

The total section is worth 40 marks.

A graduate Engineer intends to setting up a small factory in Adelaide to record and distribute a soil conditioning product. She has prepared the cash flow statement on the attached page.
All values are in $,000. The following questions relate to this statement.

1) List three items that might be included as the CAPEX in Column B. **(6 marks)**

i)_____

ii)_____

iii)_____

2) List three items that might be included as the OPEX in Column E **(6 marks)**

i)_____

ii)_____

iii)_____

3) Why is an amount of $1,000 included in Year 11 for the OPEX ? **(4 marks)**

_____

_____

4) Why is their no similar amount included in Year 11 of the CAPEX ? **(4 marks)**

_____

_____

5) What depreciation method has been used and on what basis have you reached this decision? **(2 marks)**

_____

_____

6) What is the Net Present Value (NPV) of this project? **(2 mark)**

7) Give a reason why the value obtained for the NPV would or would not be acceptable? **(3 mark)**

8) What is the internal rate of return for this project? **(3 mark)**

9) When is the undiscounted payback period for this project? **(3 mark)**

10) When is the discounted payback period for this project ? **(3 mark)**

11) Currently 90 day bank bills are trading at 7.2% while the share market is returning on average 9.5%. What beta factor must be appropriate to her company for her to be using the particular discount rate that she is applying to this project?

(4 marks)

Depreciation rate = 15%
Tax rate = 35%
Discount rate = 15%

A	B	C	D	E	F	G	H	I	J	K	L	M	N
Year	CAPEX	Depreciation	Book value	OPEX	Operating profit before depreciation and tax	Operating profit before tax	Operating profit after tax	Operating surplus	Undiscounted cash flow	Sum undiscounted cash flow	P/F	Discounted cash flow	Sum discounted cash flow
0	-6,000		6,000						-6,000	-6,000	1.00	-6000	-6000
1	-3,500	900	5,100	-500	1,437	537	349	1249	-2,751	-8,751	0.87	-2392	-8392
2		765	4,335	-500	1,937	1,172	762	1527	1,027	-7,724	0.76	776	-7616
3		650	3,685		2,437	1,787	1161	1812	1,812	-5,913	0.66	1191	-6425
4		553	3,132		2,937	2,384	1550	2102	2,102	-3,810	0.57	1202	-5223
5		470	2,662		3,437	2,967	1929	2398	2,398	-1,412	0.50	1192	-4030
6		399	2,263		3,937	3,538	2299	2699	2,699	1,287	0.43	1167	-2863
7		339	1,923		3,437	3,097	2013	2353	2,353	3,640	0.38	885	-1979
8		289	1,635		2,937	2,648	1721	2010	2,010	5,650	0.33	657	-1322
9		245	1,390		2,437	2,192	1425	1670	1,670	7,320	0.28	475	-847
10		1390	0		1,937	547	356	1745	1,745	9,065	0.25	431	-416
11				1,000	1,437	1,437	934	934	1,934	10,999	0.21	416	0