UNIVERSITI SAINS MALAYSIA

Second Semester Examination
Academic Session 2006/2007

April 2007

EKC 367E – Plant Safety
[Keselamatan Loji]

Duration : 3 hours
[Masa : 3 jam]

Please ensure that this examination paper contains TWELVE printed pages and ONE printed page of Appendix before you begin the examination.

[Sila pastikan bahawa kertas peperiksaan ini mengandungi DUA BELAS muka surat yang bercetak dan SATU muka surat Lampiran sebelum anda memulakan peperiksaan ini.]

Instruction: Answer **FOUR (4)** questions. Answer any **TWO (2)** questions from Section A. Answer any **TWO (2)** questions from Section B.

*[**Arahan:** Jawab **EMPAT** (4) soalan. Jawab mana-mana **DUA** (2) soalan dari Bahagian A. Jawab mana-mana **DUA** (2) soalan dari Bahagian B.]*

[PELAJAR DIBENARKAN MENJAWAB SEMUA SOALAN DALAM BAHASA INGGERIS ATAU BAHASA MALAYSIA ATAU KOMBINASI KEDUA-DUANYA.]

Section A : Answer any TWO questions.
Bahagian A : Jawab mana-mana DUA soalan.

1. [a] Discuss the following:

[i] OSHA incidence rate

[ii] Fatal accident rate

[iii] Fatality rate

[5 marks]

[b] [i] What is meant by an inherently safe plant?

[ii] Discuss various inherent safety techniques which are used in chemical industry

[9 marks]

[c] An industry has 2200 workers. In a particular year this industry had 50 reportable lost-time injuries and illness with a resulting 300 lost workdays. Find OSHA incidence rate based on injuries and lost workdays

[3 marks]

[d] The peak-overpressure expected due to explosion of a tank is approximated by the equation

$$\log [P/6894.8] = 4.2 - 1.8 \log [3.281\ r]$$

where P = overpressure, N/m^2
r = distance, m

The plant employs 700 people in a work area from 5 to 160m from the potential blast site. Estimate the number of fatalities due to lung hemorrhage. Probit correlation:

$Y = -77.1 + 6.91 \ln P$
Y = death from lungs hemorrhage

[8 marks]

1. [a] Bincangkan yang berikut:

[i] Kadar kemalangan OSHA

[ii] Kadar kemalangan maut

[iii] Kadar maut

[5 markah]

[b] [i] Apakah yang dimaksudkan dengan loji selamat terwujud?

[ii] Bincangkan teknik-teknik keselamatan terwujud yang digunakan dalam industri kimia

[9 markah]

[c] Sebuah industri mempunyai 2200 orang pekerja. Bagi suatu tahun tertentu, industri tersebut mempunyai 50 kes kecederaan dan kesakitan masa-hilang yang boleh dilaporkan perkara ini telah menghasilkan kehilangan 300 hari kerja. Kirakan kadar kemalangan OSHA berdasarkan kecederaan dan hari kerja yang hilang.

[3 markah]

[d] Persamaan penghampiran bagi puncak-tekanan lebihan yang dijangka berlaku akibat daripada letupan tangki ialah

$$\log [P/6894.8] = 4.2 - 1.8 \log [3.281\ r]$$

di mana P = *tekanan lebihan,* N/m^2
r = *jarak, m*

Loji tersebut mempunyai 700 orang pekerja dalam kawasan kerja 5 hingga 160 m dari tapak letupan berpotensi. Anggarkan bilangan kes maut akibat dari pendarahan paru-paru. Sekaitan probit:

$Y = -77.1 + 6.91 \ln P$
Y = *kematian dari pendarahan paru-paru*

[8 markah]

2. [a] Discuss various control techniques which are used in chemical industries to protect employee from accidents and occupational health hazards.

[6 marks]

[b] Write down the working principle of ventilation

[3 marks]

[c] Discuss the following:

[i] Local ventilation

[ii] Dilution ventilation

[6 marks]