National Exams May 2012
98-CS-2-Engineering in Society - Health, Safety and the Environment
3 hours duration

Notes:

1. If doubt exists as to the interpretation of any question, the candidate is urged to submit with the answer paper, a clear statement of any assumptions made.

2. This is a Closed Book exam. No calculators are allowed for this exam.

3. Any five questions constitute a complete paper. Only the first five questions as they appear in your answer book will be marked.

4. All questions are of equal value.

5. Write your answers in point-form whenever possible, but fully.

Marking Scheme (marks)

1. (i) 6, (ii) 7, (iii) 7
2. (i) 7, (ii) 6, (iii) 7
3. (i) 7, (ii) 7, (iii) 6
4. (i) 6, (ii) 7, (iii) 7
5. (i) 7, (ii) 6, (iii) 7
6. (i) 6, (ii) 7, (iii) 7
7. (i) 6, (ii) 7, (iii) 7

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1. (i) Explain the manner by which accident and injury rates can be minimized especially in smaller companies (between 20 and 250 employees).
   (ii) What are the costs associated with the OHSA Act and Standards that companies especially the smaller ones generally object to because they feel that such costs are not economically justifiable?
   (iii) State the factors or aspects that are considered in performing economic analyses of safety and actual or potential losses.

2. (i) Explain the manner by which engineering design deficiencies can contribute to other causes of accidents.
   (ii) State the order of preference that should be followed as general principles for eliminating and controlling hazards in industry.
   (iii) What are the various safety features that can be installed in hand drills to prevent accidents?

3. (i) What is the purpose of fail-safe designs? Explain the various types of fail-safe designs.
   (ii) State the methods used for hazard-level limitation.
   (iii) What is the purpose of using monitoring devices? Give some examples of applications of monitors.

4. (i) What are the basic objectives of fire protection, prevention and control?
   (ii) Explain the means by which the spread of fire can be prevented once fire is discovered.
   (iii) What are the possible effects of fire hazards?

5. (i) What are toxic substances and their effects on human body?
   (ii) What are the possible effects of toxic material?
   (iii) State the responsibilities of the facilities and equipment designers in providing safety measures for toxic hazards.

6. (i) What are the adverse effects of vibration and noise?
   (ii) What are effects of vibration and noise on personnel, equipment and operation?
   (iii) Explain the means by which noise can be reduced in industry.

7. A drill-press operator was drilling holes while wearing gloves in metal fasteners to be used in aircraft wing gas tank assemblies. She then attempted to make a tool change while the machine was operating at a slow speed. While she was doing so, the glove on her right hand caught on the revolving drill and caused an amputation of the middle finger on her right hand.
   (i) Determine the cause of the accident.
   (ii) State the corrective actions required.
   (iii) Suggest the follow-up action required.