

**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 OHS 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.