

National Exams May 2009
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.

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1.
 - (i) State the concept of “system safety” in the context of accident causation or avoidance.
 - (ii) Explain the cooperative agreements the companies may establish with the OSHA for maintaining safe and healthful employment to obtain exemption from certain inspections.
 - (iii) What are the priorities generally followed in making worker safety inspection in industrial plants?

2.
 - (i) Explain the design deficiencies or defects which affect product or process safety causing hazards to the user or operator.
 - (ii) What is the purpose of job safety analysis? State the steps followed in conducting a job safety analysis.
 - (iii) What are the features of an effective machine guard or safety device?

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) State the characteristics of various fire detection systems.
 - (ii) What are the means of suppressing fires?
 - (iii) What are the various sources of ignition?

5.
 - (i) Certain chemical agents are especially harmful to specific organs. Name the specific organs that are affected by such chemical agents.
 - (ii) How are the toxic agents detected? What are the typical industrial operations that require the use of respiratory protective equipment and protective clothing?
 - (iii) Explain the various damages by chemical agents to skin.

6.
 - (i) What are the engineering controls that can be used to reduce vibration and noise levels in industry?
 - (ii) State the means of isolating sources and isolating personnel from noise exposure.
 - (iii) Explain the elements of a hearing conservation program (HCP).

7. A shipping department packager in a small manufacturing plant placed a gear on a layout table and sprayed it with a rust preventative before packing it for shipment. After the employee had sprayed several gears, the spray gun became clogged and failed to operate. The employee tried to clean the clogged spray gun tip. At that instant, the gun discharged, and the employee’s left thumb was severely lacerated and subsequently had to be amputated.
 - (i) Determine the cause of the accident.
 - (ii) State the corrective actions required.
 - (iii) Suggest the follow-up action required.

Marking Scheme (marks)

1. (i) 6, (ii) 7, (iii) 7
2. (i) 6, (ii) 7, (iii) 7
3. (i) 7, (ii) 7, (iii) 6
4. (i) 7, (ii) 7, (iii) 6
5. (i) 7, (ii) 7, (iii) 6
6. (i) 7, (ii) 7, (iii) 6
7. (i) 6, (ii) 6, (iii) 8