

National Exams May 2007
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.

Front Page

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1.
 - (i) Since the implementation of the OSHA Act, with particular reference to the systems approach and ergonomics, state the positive developments that have taken place recently.
 - (ii) What is your understanding of the concept of “system safety”, in the context of accident causation or avoidance?
 - (iii) State the priorities that are generally followed in making safety inspections in industrial plants.

2.
 - (i) State the engineering design principles that can be applied to reduce or eliminate hazards in industry.
 - (ii) Give examples of methods by which hazard levels may be limited in industry.
 - (iii) Discuss engineering design pitfalls with particular reference to machine guarding.

3.
 - (i) Isolation can be used to prevent injury or damage. Give some examples.
 - (ii) State briefly the methods used to reduce failure rate.
 - (iii) State the steps followed in the investigation of an accident. What are the basic or typical equipment used for accident investigation?

4.
 - (i) What are the means by which fires can be suppressed?
 - (ii) State the manner by which immediate evacuation of personnel is provided, once fire is discovered in a building.
 - (iii) What are the advantages of sprinkler systems? Explain wet, dry and deluge systems. State the main reason the sprinkler system sometimes fails to operate.

5.
 - (i) What are toxic substances and their effects on the human body?
 - (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) State the specific organs of the body that are especially harmed by certain chemical agents.

6.
 - (i) State the characteristics and purpose of: (a) an audiometric test program, (b) a sound-level meter, and (c) an octave-band analyzer.
 - (ii) What are the engineering controls that can be used to reduce vibration and noise levels in industry?
 - (iii) What are the sources of vibrations and noise in equipment?

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.