

**National Exams May 2002**

**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.
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) What are the responsibilities of employers and employees under the Occupational Health and Safety act (OHSA)?  
(ii) Discuss the concept of the new engineering discipline, *system safety* with particular reference to “unsafe acts of persons” and “unsafe conditions.”  
(iii) Give some examples of “unsafe acts of persons” and “unsafe conditions.”
2. (a) Explain the concept of “risk-cost-benefit” analysis and the validity of such quantitative appraisal for accident prevention.  
(ii) What are the steps followed in the investigation of an accident? What are the basic or typical accident investigation equipment?  
(iii) What are the most commonly recommended methods of preventing recurrence of accident?
3. (i) Rank the hazards from which most fires originate. Discuss briefly each hazard.  
(ii) State the classification of fires and method of extinguishing each classification of fires.  
(iii) Name at least five barriers used in industry to limit the spread of fire in the event of a fire taking place. Discuss briefly.
4. (i) State the means of preventing accident from a hazard.  
(ii) How would you minimize and control damage from a hazard?  
(iii) State the order of preference that should be followed to eliminate and control hazards.
5. (i) What is hypoxia? What are the effects of hypoxia on people?  
(ii) Distinguish between toxicity and hazard. What are the key elements that must be considered when evaluating health hazard?  
(iii) State the general methods and principles used to control harmful environmental stresses.
6. (i) Explain the use of good engineering measures that can be taken to reduce noise levels in industry.  
(ii) What are the sources or causes of vibration in equipment?  
(iii) Explain the effects of vibration and noise on personnel, equipment and operation.
7. An employee in a foundry was using an over-head wall-mounted electrically controlled crane to move a heavy casting from one position to another at his workstation. The casting weighed approximately 3,000 pounds. While he was moving the casting, it fell, causing the hoist cables to snap and strike the employee a glancing blow to his head. Fortunately, he was wearing protective head gear, or the blow could have been fatal when the hoist eyebolt assembly failed.  
(i) Determine the causes of accident.  
(ii) State the corrective actions required.  
(iii) Suggest the follow-up action required.