

**National Exams May 2016**  
**98-Ind-B10 - Industrial Safety and Health**  
**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) 7, (ii) 7, (iii) 6
2. (i) 6, (ii) 7, (iii) 7
3. (i) 7, (ii) 7, (iii) 6
4. (i) 7, (ii) 6, (iii) 7
5. (i) 7, (ii) 6, (iii) 7
6. (i) 7, (ii) 7, (iii) 6
7. (i) 6, (ii) 8, (iii) 6

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1. (i) State the areas other than operator error that can cause failure of equipment and accident. Name and explain the new engineering discipline or concept that grew out of the idea of other areas responsible for accident causation or avoidance.  
(ii) State the costs associated with the Occupational Health and Safety Act (OHSA) and OHSA standards that companies, especially the smaller (20 to 250 employees) ones, generally object to because they feel that such costs are not economically justifiable.  
(iii) Explain the manner by which unsafe conditions contributing to an unsafe act resulting in an accident, can be uncovered.
2. (i) State the manner by which fault-free analysis can be used in accident investigation. What are the limitations of the fault-free analysis?  
(ii) What is the purpose of job safety analysis (JSA)? State the steps followed in conducting a job safety analysis.  
(iii) Explain the concept of failure modes and effects analysis (FMEA) in the context of reliability engineering.
3. (i) Certain chemical agents are especially harmful to specific organs. Name the specific organs that are affected by such agents.  
(ii) Explain the various types of damage caused by chemical agents to skin.  
(iii) State the possible effects of toxic material on the operator.
4. (i) State the various types of air contaminants. What are the basic approaches to measuring air contaminant exposure?  
(ii) Define hypoxic hypoxia. What are the causes of hypoxic hypoxia?  
(iii) What are the properties of the various chemicals used as air purifiers in canisters?
5. (i) State the rules that should be followed for proper use of the respiratory protective equipment.  
(ii) State the major types of respiratory protective equipment.  
(iii) What are the typical or normal hazardous operations in industry that require respiratory equipment and protective clothing?
6. (i) Define physical hazards and name some of the physical hazards.  
(ii) What is a confined space? Give some examples of confined spaces.  
(iii) What is your understanding of the criterion for permit-required confined space?
7. An employee in a foundry was using an overhead 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 the accident.  
(ii) State the corrective actions required.  
(iii) Suggest the follow-up action required.