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. Candidates may use one of two calculators, the Casio or Sharp approved models.

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. Show all calculations.

Marking Scheme (marks)

1. (i) 6, (ii) 7, (iii) 7
2. (i) 7, (ii) 7, (iii) 6
3. (i) 7, (ii) 6, (iii) 7
4. (i) 6, (ii) 7, (iii) 7
5. (i) 7, (ii) 7, (iii) 6
6. (i) 6, (ii) 6, (iii) 8
7. (i) 7, (ii) 7, (iii) 6
1. (i) State the elements of Domino Theory.
   (ii) Explain by means of a diagram, the four system safety factors: the four Ms.
   (iii) What is single factor theory? Explain its limitation.

2. (i) What are the engineering activities that result in hazards in industry?
   (ii) State the other (than engineering) factors causing hazards.
   (iii) What are the components of communication essential in safety engineering? Show by means of a diagram.

3. (i) State the safety practices and safeguards for controlling hand tools hazards?
   (ii) State the factors that contribute to manual materials handling injuries, especially low back pain.
   (iii) What are the frequently recommended lifting procedures?

4. (i) Explain the characteristics of the following fire detectors: (a) heat detectors, and (b) smoke detectors.
   (ii) State the characteristics of the following sprinkler systems: (a) wet-type, (b) dry-type and (c) deluge.
   (iii) What is your understanding of the fire suppression systems that do not use water?

5. (i) State the steps followed in the conduct of a safety audit process.
   (ii) What is the purpose of accident investigation? State the criteria used to decide which accidents to investigate.
   (iii) State the classic steps followed in accident investigation.

6. (i) State the detrimental effects (other than hearing loss) from noise.
   (ii) What is your understanding of audiology and audiogram?
   (iii) An industrial worker is exposed to the following noise levels during an 8-hour work shift: 80 dBA for 4 hrs, 85 dBA for 2hrs, 90 dBA for 1 hr and 95 dBA for 1 hr. Calculate the combined effect or the daily noise dose, (OSHA permissible exposure levels for duration/day are: 80 dBA -16 hrs, 85 dBA - 8 hrs, 90 dBA -4 hrs and 95 dBA - 2 hrs.). Is the daily noise acceptable? If this is not, then what should be done?

7. A millwright was reaching out to make an adjustment on a flywheel chain on a press while standing on a 20-foot ladder. In doing so, he lost his balance and fell onto the shaft and then struck a conveyor and fell to the floor, approximately 15 feet below. This caused a compound fracture of his right leg and property damage of $5,000 for a broken shaft and belts on a large press and broken guard on the conveyor belt.
   (i) Determine the cause of the accident.
   (ii) State the corrective actions required.
   (iii) Suggest the follow-up actions required