

**National Exams May 2013**  
**98-Ind-B6 -Workplace Design**  
**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. 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 the calculations.

**Marking Scheme (marks)**

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

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1. (i) State the factors that can influence human control.  
(ii) What are the primary coding methods used for the identification of controls? Explain briefly.  
(iii) Explain the concept of optimum control-response or C/R ratio (in the past known as control-display or C/D ratio) by means of a diagram.
2. (i) What are the basic and specific features of conventional quantitative displays?  
(ii) What are the factors that should be considered in control design?  
(iii) State the general guidelines or priorities for designing workplaces that involve visual displays and controls.
3. (i) What are the consequences of improper posture in a work station?  
(ii) From the anthropometric viewpoint, what are the two important considerations that must be taken into account for the workstation design?  
(iii) Operators in industry generally perform their tasks in (1) seated, (2) standing, and (3) sit-stand positions. State and explain the best and worst working positions.
4. (i) State the “task characteristics” that should be considered in designing a manual materials handling job to minimize industrial hazard.  
(ii) What are the two most promising engineering solutions to minimize industrial hazards due to manual materials handling?  
(iii) For a particular lifting task, the following data are known: lifting height = 4 ft, weight = 55 lbs., energy consumption for the task = 5 gram-calories per ft.lb. and desirable energy limit = 200 kcal per hour. Calculate the number of lifts per hour that should be performed.
5. (i) State general guidelines or priorities followed in designing individual workplaces.  
(ii) Define the concept of normal, maximum and extreme work areas, in the context of workplace design.  
(iii) State the factors affecting workplace envelope.
6. (i) State the areas of application of human engineering.  
(ii) What is the difference between open-loop and closed loop-systems?  
(iii) Show by means of a diagram the characteristics of an automated system. Give an example. Is an automated system open-loop or closed-loop.
7. (i) What are the guiding principles of component arrangement?  
(ii) What are the different classes of control links used in determining relationships between components (people or things)? Explain.  
(iii) Describe the procedure of link analysis for the purpose of developing optimum arrangement of equipment and people. Show the procedure by using suitable symbols.