

National Exams December 2010
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)

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|----|--------|---------|---------|
| 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) 8, | (iii) 6 |
| 5. | (i) 6, | (ii) 7, | (iii) 7 |
| 6. | (i) 7, | (ii) 6 | (iii) 7 |
| 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) State the factors affecting the level of energy consumption on a particular task.
(ii) Explain the means by which energy expenditure can be maintained within reasonable limits for human work activities.
(iii) Define human strength. How are the static (isometric) and dynamic (isokinetic) strengths measured?
4. (i) What are the three distinct approaches to assessing manual materials handling or MMH capabilities? Explain.
(ii) State the factors responsible for back injuries in lifting tasks.
(iii) Explain the means by which the risk of MMH can be reduced.
5. (i) What are the consequences of improper posture in a work situation?
(ii) For a particular lifting task, the following data are known: lifting height = 4ft., weight = 55lbs., energy consumption for the task = 5 gram-calories per ft. lb. and desirable energy limit = 200 kcl/hour. Calculate the number of lifts that should be performed.
(iii) For a given activity, the following data are known: average energy consumption for the work = 6 kcl/min; standard energy consumption = 4.2 kcl/min; resting level energy consumption = 1.5 kcl/min; total working time = 8 hours. Calculate the rest required in minutes per hour.
6. (i) State the general principles used in the application of anthropometric data.
(ii) Explain the concepts of: (a) horizontal work surface area, and (b) work surface height, in the context of workspace/workplace design.
(iii) State the general principles of seat design.
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.