

National Exams December 2017

98-Ind-A2-Analysis and Design of Work

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) 7, | (ii) 6 |
| 4. | (i) 8, | (ii) 6, | (iii) 6 |
| 5. | (i) 7, | (ii) 6, | (iii) 7 |
| 6. | (i) 6, | (ii) 7, | (iii) 7 |
| 7. | (i) 7, | (ii) 6, | (iii) 7 |

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1. (i) What are the graphical tools available for work methods analysis?
(ii) Show the basic features of a human-machine chart, including the summary form of such a chart. What are the main uses of a human-machine chart?
(iii) In the conduct of the operations analysis, explain the importance of: (a) design of parts, and (b) process of manufacture.
2. (i) State the basis principles of motion economy for the “use of the human body”.
(ii) State the body members involved in the five classifications of movements. Explain the concept that all motions should be made at the lowest classification of movements.
(iii) State briefly the macroscopic approaches to making improvements in the workplace.
3. (i) Why are performance rating and allowances so critical and controversial in stop-watch time study? What approaches may be taken to alleviate the problems of performance rating and allowances in industry?
(ii) In a stop-watch time study, the following information is provided for a given work element: number of readings = 25, mean element time = 0.20 min., standard deviation = 0.06 min.
(a) Calculate the range of elemental time values at a confidence level of 95% and the percentage of the accuracy level.
(b) Suppose it is desired in the above problem that the mean elemental time should be within the accuracy level of 10% with a confidence level of 95%. Determine the number of observations or readings that must be taken to achieve this.
4. For a drill press operations, the following data are known:

Work Elements	Observed time (min.)	Rating %
1. Load drill press	0.30	120
2. Drill hole with automatic power feed	0.12	100
3. Check tolerance of the last piece produced during machine cycle (#2) with go/no-go gauge	0.08	110
4. Unload drill press	0.25	115

The company allows: 5% for personal, 5% for unavoidable delays and 5% for fatigue.

- (i) Calculate the normal time and the standard time for the operation in min./pc.
 - (ii) Define performance rating and normal time.
 - (iii) What are the uses of time standards?
5. (i) State the concept of Methods-Time Measurement (MTM) system. How was it developed?
(ii) Explain the concept of MOST (Maynard Operation Sequence Technique) work measurement technique.
(iii) Some companies are experiencing a tendency for their work measurement analysts to become more liberal in their performance rating evaluation over the years. How do fundamental motion data offset the tendency towards creating loose standards?

6. (i) What is the basic purpose of employing work sampling techniques? What are the applications or uses of work sampling?
- (ii) The following data were obtained during the course of the day to establish standard time for a lathe machine operation by means of work sampling: total number of observations = 150, number of observations operator idle = 50, average performance rating = 150%, total time worked per day = 480 min., number of pieces produced per day = 250 pcs. The company allows 5% for personal, 5% for unavoidable delays and 5% for fatigue in establishing time standards. Determine the standard time in min./pc.
- (iii) Assume that the work sampling study was continued for the second day and a total of 300 observations were obtained, of these observations, the operator was found idle 75 times. Determine the relative and absolute accuracies of operator idle time at a confidence level of 99%.
7. (i) State the steps that are followed in installing a point-system of a job evaluation plan.
- (ii) State the reasons for installing a wage incentive plan in a company. What are the reasons for wage incentive plan failures?
- (iii) Explain the characteristics of the following direct financial plans: (a) piece work, (b) standard hour plan, and (c) measured day work. Which incentive plan is most commonly used in industry, and why?