

National Exams May 2003

98-Ind-A2, Analysis & 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.

Front Page

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98-Ind-A2 –Analysis and Design of Work

1. (a) What are the opportunities for savings through the application of methods engineering and work measurement?
 (b) State the manner by which the principles of motion economy can be applied for the design of tools and equipment.
 (c) As an industrial engineer, you have been asked to make methods improvement in a metal manufacturing plant. State the various areas of operation you would investigate to accomplish your objective.

2. (a) What is the basic difference between flow process chart and flow diagram?
 (b) Show the proper flow process chart symbols for the following processes: (1) move material by truck, (2) raw material in bulk storage, (c) examine material for quality, (4) material in truck waiting to be processed, and (5) mix material to proper consistency.
 (c) State the factors that must be considered to provide a safe and healthful workplace for the workers.

3. (a) 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?
 (b) For a given work element in a stop-watch study the following information is given:
 number of reading = 25, mean element time = 0.20 min., and standard deviation = 0.06 min.
 (i) Calculate the range of elemental time values at a confidence level of 95% and the percentage of accuracy level.
 (ii) Suppose it is desired in the above problem that the mean elemental time should be within the accuracy level of $\pm 10\%$ within a confidence level of 95%. Determine the number of observations or readings that must be taken to achieve this.

4. (a) The following data are know for a drill press operation:

Elements	Observed time (min./pc.)	Rating %
1. Load drill press	0.20	115
2. Drill hole with automatic power feed	0.25	100
3. Check tolerance of the last piece produced during machine cycle (#2) with go/no-go gauge	0.10	110
4. Unload drill press	0.15	120

The company allows: 5% for personal, 5% for unavoidable delays and 5% for fatigue. Calculate the normal time and the standard time for the operation in min./pc.

- (b) Why is important to maintain time standards properly/accurately, especially for the company which follows a wage incentive program? What procedure would you recommend for a sound program for the maintenance of time standards?
- (c) Show by means of a typical productivity increase graph or learning the most desirable stage in the production to establish the time standard.

5. (a) State the concept of Methods-Time-Measurement (MTM) system. How was it developed?
(b) Some companies are experiencing a tendency for their work measurement analysts to become more liberal in their performance rating over a period of years. How do fundamental motion data offset this tendency toward creating loose standards?
(c) What is the basic advantage of using Maynard operation sequence technique or MOST?

6. (a) What is the basic purpose of employing work sampling techniques?
What are the applications or uses of work sampling?
(b) 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..
(c) 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. (a) What procedures or steps should be followed in installing a point-system method of a job evaluation plan? (Write the procedure in a systematic manner, preferably in point-form).
(b) What are the fundamental prerequisites of a successful wage incentive plan?
(c) Why is it essential to keep time standards up-to-date if a wage incentive plan is to succeed?