

National Exams May 2012
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

Marking Scheme (marks)

- | | | | |
|----|---------|---------|---------|
| 1. | (i) 6, | (ii) 8, | (iii) 6 |
| 2. | (i) 6, | (ii) 7, | (iii) 7 |
| 3. | (i) 8, | (ii) 6, | (iii) 6 |
| 4. | (i) 10, | (ii) 6, | (iii) 4 |
| 5. | (i) 8, | (ii) 6, | (iii) 6 |
| 6. | (i) 7, | (ii) 6, | (iii) 7 |
| 7. | (i) 7, | (ii) 6, | (iii) 7 |

National Examination May 2012
98-Ind-A2 –Analysis and Design of Work

1. (i) State the broad areas of opportunities for savings through the application of methods engineering and work measurement.
(ii) Show the basic features of a flow process chart, including the summary form of such a chart. What are the main uses of such a chart?
(iii) As an industrial engineer, you are asked to make methods improvement in a metal cutting manufacturing plant. State the various areas of the operation you would investigate to achieve your objective.

2. (i) What are the macroscopic approaches to methods improvement in the workplace?
(ii) State the basic principles of motion economy that can be applied in the design of tools and equipment.
(iii) What are the common considerations for improving working conditions? State the benefits of ideal working conditions.

3. (i) Determine the expected unit cost of output, when the operator is assigned four machines. The following data are known:
Operator rate = \$12.00 per hour,
Machine rate = \$20.00 per hour,
Average machine downtime per machine per hour = 6 min.
Machine servicing time per unit = 12 min.,
Machine time per unit = 45 min.
(ii) Why are performance rating and allowances considered important in stop-watch time study?
(iii) What approaches may be taken to overcome the problems of performance rating and allowances in industry?

4. (i) For a drill press operation, the following data are known:

Work 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.

- (ii) Why is it 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?
- (iii) Show by means of a typical productivity increase graph or learning, the most desirable stage in the production to establish the time standard.

5.
 - (i) What are the advantages and disadvantages of predetermined motion times compared to step-watch time study?
 - (ii) How would you explain to a worker in your company who knows nothing about MTM (Methods-Time Measurement), what it is and how it is applied?
 - (iii) Explain the factors that influence the reach and the move times in the MTM system.

6.
 - (i) Computerized work sampling will become an increasingly popular method in the future. What are the possible applications of such a method?
 - (ii) How can the validity of work sampling be sold to the operator not familiar with probability and statistical procedure?
 - (iii) It has been decided to determine the percentage of idle time for the numerically-controlled lathe machine. A trial study revealed that out of 150 observations, 30 observations showed that the machine was idle. Determine the number of random observations (sample size) required to achieve an accuracy of $\pm 10\%$ at a confidence level of 95%.

7.
 - (i) What is the purpose of job evaluation? Explain the concept of job analysis in the context of job evaluation.
 - (ii) What are the principal benefits of a properly installed job evaluation plan?
 - (iii) What are the common methods used for job evaluation? Explain briefly.