

National Exams December 2008
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) 7, | (ii) 6, | (iii) 7 |
| 2. | (i) 6, | (ii) 7, | (iii) 7 |
| 3. | (i) 8, | (ii) 6, | (iii) 6 |
| 4. | (i) 8, | (ii) 6, | (iii) 6 |
| 5. | (i) 7, | (ii) 6, | (iii) 7 |
| 6. | (i) 7, | (ii) 6, | (iii) 7 |
| 7. | (i) 7, | (ii) 6, | (iii) 7 |

National Examination December 2008
98-Ind-A2 –Analysis and Design of Work

1. (i) What are the opportunities for savings through the application of methods engineering and work measurement?
(ii) State the manner by which the principles of motion economy can be applied for the design of a workplace layout.
(iii) As an industrial engineering, you are asked to make methods improvement in a metal cutting manufacturing plant. State the various areas of operation you would investigate to achieve your objective.

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

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. 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) In the MTM system, explain the factors that influence the reach and move times.
 - (iii) Explain the concept of MOST (Maynard Operation Sequence Technique) work measurement technique.

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) 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?