

National Exams December 2013
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) 7, | (ii) 7, | (iii) 6 |
| 2. | (i) 7, | (ii) 7, | (iii) 6 |
| 3. | (i) 8, | (ii) 6, | (ii) 6 |
| 4. | (i) 10, | (ii) 6, | (iii) 4 |
| 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) Explain the concept of operations analysis in the context of methods engineering. What are the primary approaches to operations 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) State the manner by which the principles of motion economy can be applied for the design of equipment and tools.

2. (i) Why should the methods analyst accept as a part of his or her responsibility the provision of good working conditions? Do working conditions appreciably affect output? Explain.
(ii) State the manner by which the principles of motion economy can be applied for the design of tools and equipment.
(iii) What are the major factors affecting fatigue of the operator?

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) 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 technique?
(ii) What is the basis of work sampling theory? When does the binomial distribution approach normal distribution?
(iii) State the advantages and disadvantages of work sampling over stop-watch time study.
7. (i) What are the principal negative considerations that should be understood prior to the installation of a point job evaluation plan?
(ii) What are the principal benefits of a properly installed job evaluation plan?
(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?