National Exams December 2014
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)

1.	(i) 6,	(ii) 7,	(iii) 7
2.	(i) 6,	(ii) 7,	(iii) 7
3.	(i) 7,	(ii) 7,	(ii) 6
4.	(i) 8,	(ii) 6,	(iii) 6
5.	(i) 7,	(ii) 7,	(iii) 6
6.	(i) 6,	(ii) 7,	(iii) 7
7.	(i) 6,	(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) 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) 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) What are the fundamental motions and symbols used in Methods-Time Measurement (MTM)?
   (ii) 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 toward creating loose standards?

(iii) What are the basic advantages of using MOST (Maynard Operation Sequence technique)?

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 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.