

National Exams May 2004

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.

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1. (a) What are the basic subdivisions to the principles of motion economy? State the classification of movements.
 (b) Show the basic features of a human-machine chart, including the summary form of such a chart.
 (c) In the conduct of the operations analysis, explain the importance of the (1) process of manufacture, and (2) set-up and tools.

2. (a) What are the macroscopic approaches to methods improvement in the workplace?
 (b) State the basic principles of work design with particular reference to the workplace.
 (c) As an Industrial Engineer, you have been asked to make methods improvement in a metal manufacturing plant. State the various areas of the operation you would investigate to accomplish your objective.

3. (a) For a machining operation, determine the expected unit cost of output, when the operator is assigned four machines. The following data are known:

(i) Operator rate	= \$6.00 per hour
(ii) Machine rate	= \$10.00 per hour
(iii) Average machine downtime per machine per hour	= 6 min.
(iv) Machine servicing time per unit	=12 min.
(v) Machine time per unit	=45 min.

 (b) Why performance rating and allowances are considered important in stop-watch time study? What approaches may be taken to alleviate the problem of performance rating and allowances in industry?

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

Work elements	Observed time (min.)	Rating %
1. Load drill press	0.25	110
2. Drill hole with automatic power feed	0.15	100
3. Check tolerance of the last piece produced during machine cycle (#2) with go/no-go gauge	0.08	115
4. Unload drill press	0.20	120

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) For the above operation, show by means of a diagram: external time, internal time, idle time, machine time, and total cycle time.
- (b) Why is it important to maintain time standards in a plant which follows a wage incentive system? What procedure would you recommend for a sound program for the maintenance of time standards?

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5. (a) State the advantages and disadvantages of predetermined motion times compared to stop-watch time study.
(b) Explain the concept of MOST (Maynard Operation Sequence Technique) work measurement technique.
(c) What is the basic advantage of using Maynard operation sequence technique or MOST?
6. (a) State the concept of work sampling. What are the uses or applications of work sampling?
(b) What are the advantages and disadvantages of work sampling in comparison to work measurement (time study)?
(c) Determine the percentage of idle time for the numerically-controlled lathe machine by work sampling. A trial study made at the machine, showed that out of 200 observations, 150 observations showed that the machine was working. Determine the number of random observations required in order to achieve a confidence level of 95% and an accuracy of $\pm 5\%$.
7. (a) What are the principal negative consideration that should be understood prior to the installation of a point job evaluation plan?
(b) What are the principal benefits of a properly installed job evaluation plan?
(c) State the reasons for installing a wage incentive plan in a company. Give reasons for wage incentive plan failures.