**National Exams Dec 2018**
**17-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) 7, | (ii) 6, | (iii) 7 |
| 3. | (i) 8, | (ii) 6, | (ii) 6 |
| 4. | (i) 9, | (ii) 6, | (iii) 5 |
| 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) 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) State the manner by which the principles of motion economy can be employed in the design of tools and equipment.
(ii) Explain the role of methods analyst in providing a good working condition? Do working conditions appreciably affect output?
(iii) What are the main uses of human machine chart? Show the basic features of human machine chart, including summary form of such a chart.

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.
(iii) 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 operations, the following data are known:

| 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. Calculate the normal time and the standard time for the operation in min./pc.
(ii) What are the uses of time standards?
(iii) State the steps that are followed in a stopwatch time study.

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 techniques? What are the applications or uses of work sampling?
(ii) The following data were obtained during the course of the day to establish standard time for a lathe machine operation by means of work sampling: total number of observations = 150, number of observations operator idle = 50, average performance rating = 150%, total time worked per day = 480 min., number of pieces produced per day = 250 pcs. The company allows 5% for personal, 5% for unavoidable delays and 5% for fatigue in establishing time standards. Determine the standard time in min./pc.
(iii) Assume that the work sampling study was continued for the second day and a total of 300 observations were obtained, of these observations, the operator was found idle 75 times. Determine the relative and absolute accuracies of operator idle time at a confidence level of 99%.

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?