

GUJARAT TECHNOLOGICAL UNIVERSITY**M. E. - SEMESTER – I • EXAMINATION – SUMMER • 2013****Subject code: 714602****Date: 04-06-2013****Subject Name: Work System Design and Human Factors Engineering****Time: 10.30 am – 01.00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Explain how Method Study and Work Measurement help improve productivity of any system. **07**
- (b) Knowledge of Human Factors Engineering is essential in designing effective work system for any industry. Justify the statement with suitable example. **07**
- Q.2** (a) List the basic application of following. **07**
- (i) Operation Process Chart (ii) Flow Diagram (iii) Flow Process Chart
(iv) Two Handed Process Chart (v) Travel Chart (vi) String Diagram
(vii) Man-Machine Chart
- (b) Why allowances are given in arriving at standard time of any activity? Briefly explain different types of allowances with suitable examples. **07**
- OR**
- (b) Classify different work measurement techniques with respect to their specific application, merits and demerits. **07**
- Q.3** (a) A work sampling study was conducted on a machine to ascertain the proportion of idle time of the same. The preliminary study revealed that the machine was found idle for 30% of the time. This study was carried out with 95% confidence level and +/- 5% accuracy. Find out following. **07**
- (i) Actual size of the sample required for this study.
(ii) Revised sample size at the middle of the study where the proportion of machine idleness was found as 25%.
(iii) Accuracy of the study after making 4500 observations wherein the machine was found working during 2500 observations.
- (b) What is the significance of Rating in work measurement? Briefly explain following terms with respect to rating. **07**
- (i) Qualified Worker (ii) Tight Rating (iii) Loose Rating (iv) Standard Rating

OR

- Q.3 (a)** Construct a man-machine chart (*with conventional notations taking appropriate scale on your answer book only*) for machining process which takes 6 minutes for machining with auto feed and 3 minutes each for loading and unloading the job. Calculate total cycle time and % utilization of the operator. **07**

Construct another man-machine chart for the condition wherein the operator is asked to work on two machines simultaneously for the same job with following conditions. Calculate the increase in % utilization of the operator in this case.

- (i) It takes 1 min. for the operator to walk between two machines.
- (ii) The start point of the cycle is when loading the job on machine 1
- (iii) The end point of cycle is when operator comes back to machine 1 after unloading job from machine 2.

- (b)** Differentiate between Cumulative and Fly Back methods of time study. **07**

- Q.4 (a)** Explain how measurements of heart-rate and oxygen consumption are used to ascertain work content of a job. **07**

- (b)** Describe the basic objectives of Ergonomics with suitable examples. **07**

OR

- Q.4 (a)** What is Anthropometry? Explain the importance of Anthropometric Data in effective product design with suitable examples. **07**

- (b)** What are the measures to reduce Heat Stress in hot and humid industrial environments? **07**

- Q.5 (a)** Classify different types of displays with respect to following. **07**

- (i) Specific application
- (ii) Merits
- (iii) Demerits

- (b)** Explain the negative impacts of noise at workplace and the remedial actions for the same. **07**

OR

- Q.5 (a)** Explain the significance of illumination and vibrations in effective workplace layout. **07**

- (b)** Explain the importance of appropriate standing and seating postures in effective workplace design. **07**
