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B.TECH FIFTH SEMSTER END EXAMINATION 2013

MODEL ANSWER

AS-4144 (Exam Date: 08/11/2013)

INDUSTRIAL ENGINEERING

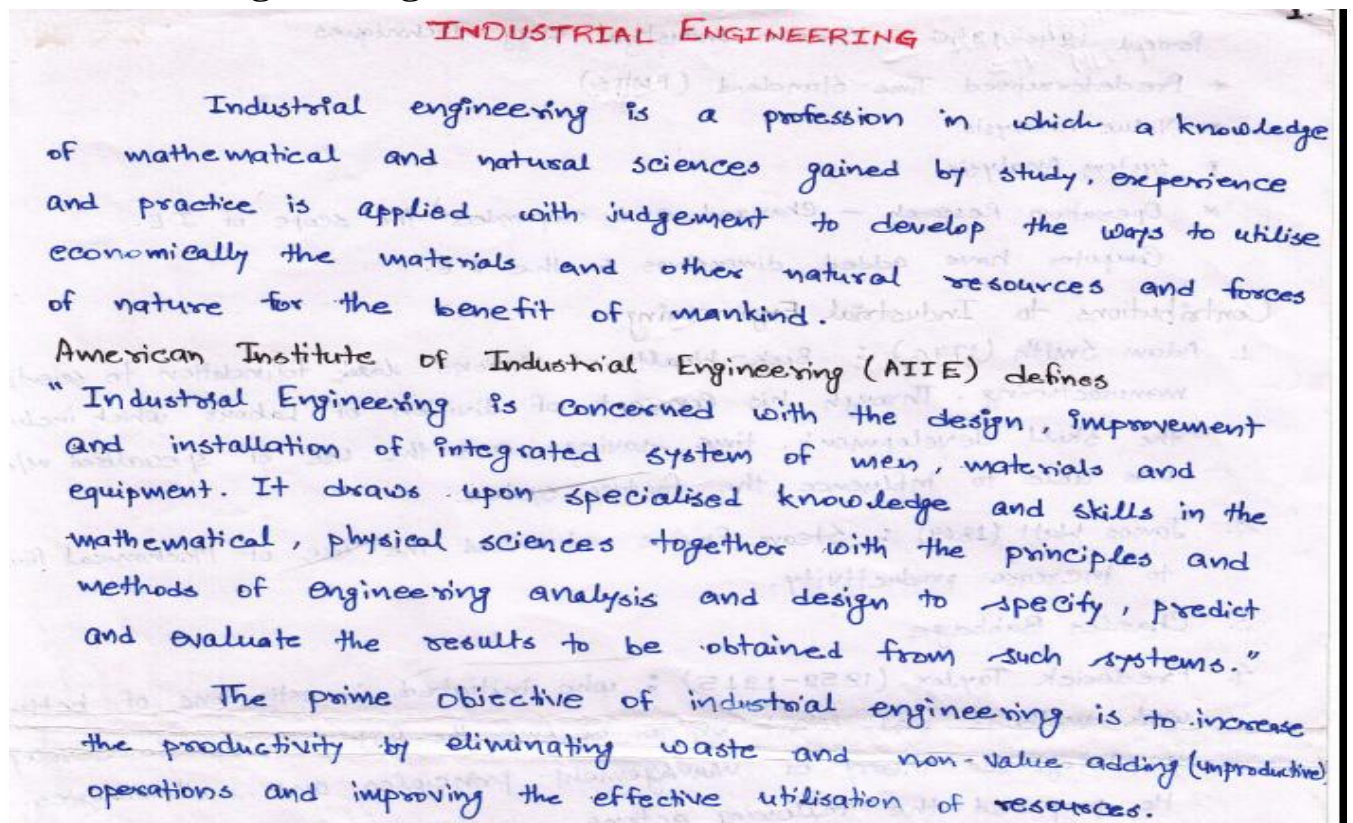
SECTION-A

1.

- i. a
- ii. c
- iii. d
- iv. c
- v. b
- vi. d

2. a-ii b-iii c-iv d-i

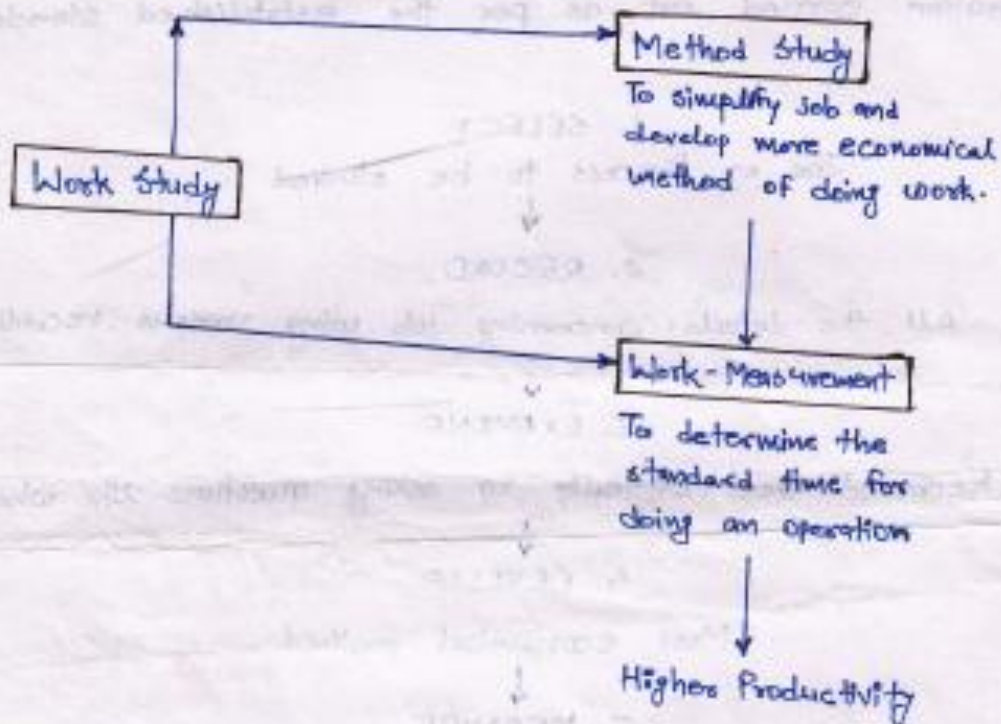
3. Industrial Engineering



4.

WORK STUDY

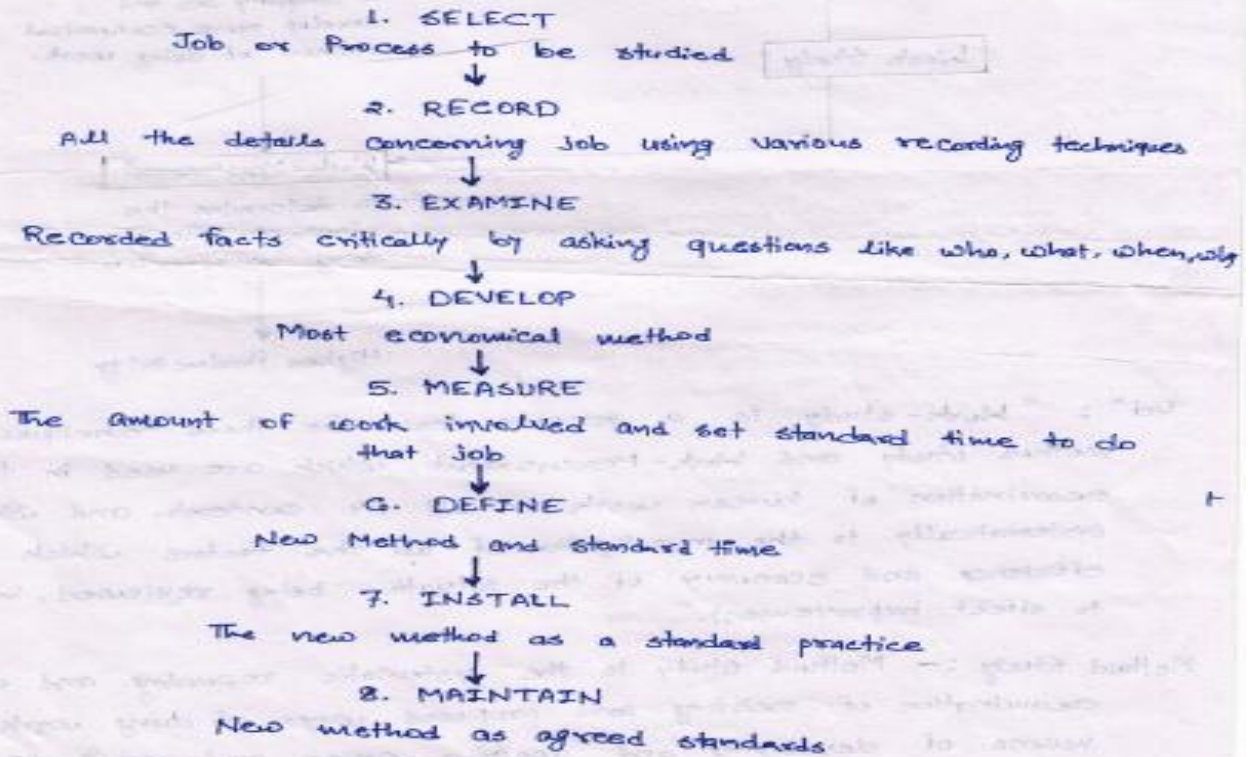
- Work-study forms the basis for work system design. The purpose of work design is to identify the most effective means of achieving necessary functions.
- Work-study aims at improving the existing and proposed ways of doing work and establishing standard times for work performance.



Defⁿ: "Work-study is a generic term for those techniques, particularly method study and Work-Measurement, which are used in the examination of human work in all its contexts, and which lead systematically to the investigation of all the factors which affect the efficiency and economy of the situation being reviewed, in order to effect improvement."

Work-Study Procedure :

Work-study is a procedure oriented and systematic study to establish the one best way method of doing an operation by investigation and analysis of all details regarding the job or operation carried out as per the established standard method.



5. (i)

History and Development of Industrial Engineering

Frederick Taylor is named as father of scientific management and Industrial Engg., there are many others who contributed to the I.E. Adam Smith's : Concept of Division of Labour Book "The Wealth of Nation" James Watt, Arkwright, Boulton Mathew and Robinson progressive and scientific attitude towards the improvement in the performance of machines and industries.

Period 1882-1912 Critical Period

The important work

- i) Factory System and Owner - engineer and manager concept
- ii) Equal Work, equal pay and incentive schemes
- iii) Scheduling and Gantt Chart
- iv) interest in cost control and accounting

F.W. Taylor, who took interest in human aspects of production

6.

2. The principles of motion economy

There are a number of “principles” concerning the economy of movements which have been developed as a result of experience and which form a good basis for the development of improved methods at the workplace. They may be grouped under three headings:

A. Use of the human body

B. Arrangement of the workplace

C. Design of tools and equipment

They are useful in shop and office alike and, although they cannot always be applied, they do form a very good basis for improving the efficiency and reducing the fatigue of manual work. The ideas expounded by Professor Barnes' are described here in a somewhat simplified fashion.

A. Use of the human body

When possible:

- (1) The two hands should begin and complete their movements at the same time.
- (2) The two hands should not be idle at the same time except during periods of rest.
- (3) Motions of the arms should be symmetrical and in opposite directions and should be made simultaneously.

B. Arrangement of the workplace

- (1) Definite and fixed stations should be provided for all tools and materials to permit habit formation.
- (2) Tools and materials should be pre-positioned to reduce searching.
- (3) Gravity feed, bins and containers should be used to deliver the materials as close to the point of use as possible.
- (4) Tools, materials and controls should be located within the maximum working area (see figure 49) and as near to the worker as possible.
- (5) Materials and tools should be arranged to permit the best sequence of motions.

C. Design of tools and equipment

- (1) The hands should be relieved of all work of “holding” the workpiece where this can be done by a jig, fixture or foot-operated device.
- (2) Two or more tools should be combined wherever possible.
- (3) Where each finger performs some specific movement, as in typewriting, the load should be distributed in accordance with the inherent capacities of the fingers.
- (4) Handles such as those on cranks and large screwdrivers should be so designed that as much of the surface of the hand as possible can come into contact with the handle. This is especially necessary when considerable force has to be used on the handle.

7.

classmate

Date _____

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Micro-motion Study

Micro-motion study provides a techniques for recording and timing an activity. Micro-motion study is a set of techniques intended to divide the human activities in a group of movements or micro-motion (called as therbligs) and the study of such movements helps to find for an operator one best pattern of movement that consumes less time and requires less effort to accomplish the task. Therbligs were suggested by Frank B. Gilbreth, the founder of motion study. Micro-motions study was originally employed for job analysis but new uses have been found for this tool.

The applications of micro-motion study include the following :

1. Is an aid in studying the activities of two or more persons on a group work.
2. As an aid in studying the relationship of the activity
3. As an aid in obtaining motion time data for time standards.
4. Acts as a permanent record of the method and time of activities of the operator and the machine.

SIMO Chart

(Simultaneous - Motion - Cycle)

A simo chart is a chart, often based on film analysis, used to record simultaneously on a common time scale the therbligs or groups of therbligs performed by different parts of the body of one or more workers.

The simo chart is the micromotion form of the man type flow process chart.

It is extremely detailed left and right hand operation chart. It shows on a common time scale the simultaneous minute movements (therbligs) performed by the two hands of an operator.

S.T.M.O. chart is generally used for micromotion analysis of a. short cycle repetitive job b. High order skill jobs. and finds applications in jobs like component assembly, packaging, inspection etc.

A simo chart shows relationship between the different limbs of an operator; for example, at any instant it can be found what the one hand is doing with respect to the other, in terms of therbligs. In addition to these relationships, a simo chart also records the duration of micromotions.

9.

Work-Measurement (Time Study)

— Planning
— Control of operation

Defⁿ:- Work-measurement is the application of techniques designed to establish the time for a qualified worker to carry out a specific job at a defined level of performance.

Objectives of Work-Measurement :-

The objectives of work measurement are to provide a sound basis for:

1. Comparing alternative methods
2. Planning and control
3. Realistic Costing
4. Financial Incentive Scheme
5. Delivery date of goods
6. Cost reduction & cost control
7. Identifying substandard workers
8. Training new employees

Time Study → A work-measurement technique for recording the times and rates of working for the elements of specific job carried out under specified conditions and for analysing the data so as to determine the time necessary for carrying out the job at the defined level of performance.

10.

Stop watch: Stop is the measuring instrument to observe the elemental timings and usually decimal watch is used.

A decimal minute stop watch has two hands. The small hand represent minutes on dial and completes one revolution in 30 minutes. The large hand represents centi minutes (1/100th minute) and completes one revolution in one minute and each division on large dial represents 0.01 minute. Two commonly used types of stop watches are:

Cumulative stop watch: The watch is started by pressing the winding knob located on the head of the watch and is stopped by pressing the winding knob. Pressing winding knob third time snaps the hands back to zero. Once started it will run until required number of cycles have been timed.

Fly back stop watch: This is most commonly used watch. In this type of watch the movement is started and stopped by a slide (A) at the side of the winding knob (B). Pressure on the top of the winding knob causes both the hands to fly back to zero without stopping the mechanism from which point they move forward immediately. This type of watch is used for either fly back

11. (ii)

Work-Sampling → A technique in which a large no. of observations are made over a period of time of one or group of machines, processes or workers. Each observation records what is happening at that instant and the percentage of observations recorded for a particular activity or delay, is a measure of the percentage of time spent on that activity.

Work-Sampling → Method of finding the occurrence of a certain activity by statistical sampling and random observation.

* Work sampling is a fact finding tool.

"A technique in which a statistically competent number of instantaneous observations are taken, over a period of time, of a group of machine, process or workers. Each observation recorded for a particular activity or delay is a measure of the percentage of observations recorded for a particular activity or delay is a measure of the percentage of time observed by the occurrence."

(i)

METHOD TIME MEASUREMENT (MTM)

The objective of MTM is the establishment of tangible, understandable and acceptable data for the scientific measurement of human effort.

Method Time Measurement is defined as:

“A procedure which analyses any manual operation or method into the basic motions required to perform it and assigns to each motion a predetermined time standard which is determined by the nature of the motion and the conditions under which it is made.”

USES OF MTM

1. Developing effective methods and plans in advance of beginning production.
2. Improving existing methods.
3. Establishing time standards.
4. Cost estimating.
5. Training supervisors to become method conscious.
6. Research in the areas like operating methods, performance rating.