



MACHAKOS UNIVERSITY

University Examinations for 2020/2021 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL AND MANUFACTURING ENGINEERING

THIRD YEAR FIRST SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (MECHANICAL ENGINEERING)

EMM 314: MANUFACTURING WORK STUDY

DATE: 13/8/2021

TIME: 8.30-10.30 AM

INSTRUCTIONS

Answer question ONE and any other two questions.

QUESTION ONE (COMPULSORY) (30 MARKS)

- a) An operator in mechanical workshop is tasked to assemble nuts and bolts as shown in the layout in figure 1 below

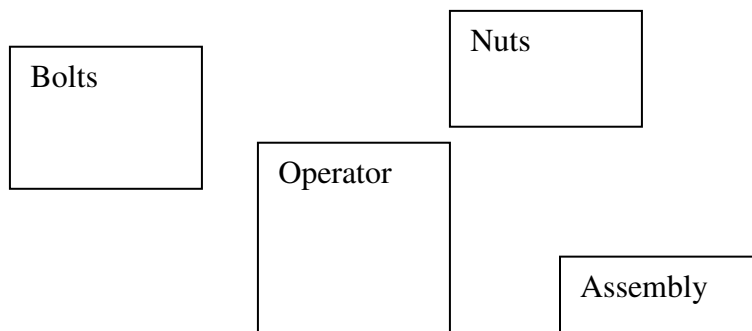


Fig 1 work bench layout

- As an Engineer, which method of study can be used under this scenario (2 marks)
- Explain four benefits of this method (6 marks)
- Describe the procedure that will be used in a form of a chart (6 marks)

- b) Flow chart is one of the tool used in analyze flow movement of material, personnel or equipment in the production shop floor. Figure 2 shows original Flow-line diagram of fettling layout

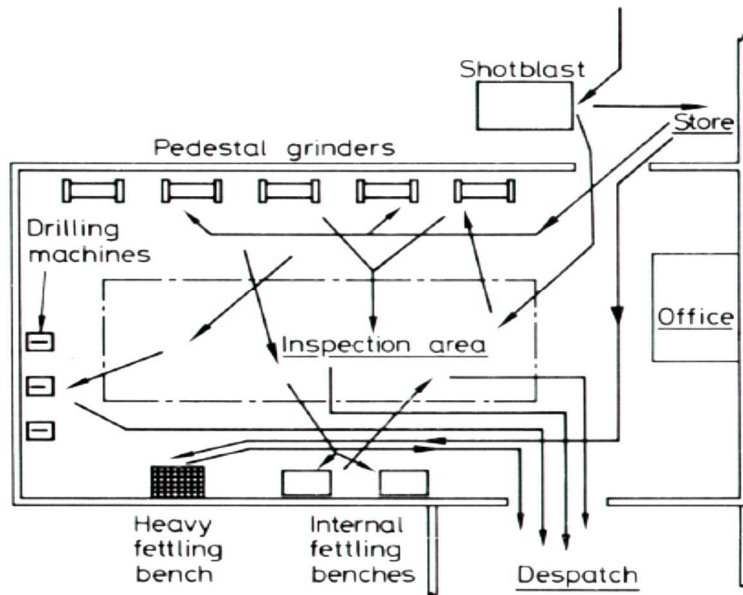


Fig. 2 Flow-line diagram of original fettling layout.

- As an Engineer redesign the plant layout so as to increase productivity. (8 marks)
- c) Describe any two considerations when selecting method of study (8 marks)

QUESTION TWO (20 MARKS)

- a) Explain in detail micro motion study charts (6 marks)
- b) Explain any three principles of motion of study as developed by Gilbreth (6 marks)
- c) A job has been sub-divided into five elements. The time for each element and respective rating are given table 1

Table 1; Element numbers of observed operation

Element Number	Observed Time	Rating Factor %
1	0.7	80
2	0.8	100
3	1.3	120
4	0.5	90
5	1.2	100

Calculate the normal time and standard time for each element and for the job if the allowances are 15%. (8 marks)

QUESTION THREE (20 MARKS)

- a) An Operator is manning two machines, a washing machine and a dryer. The operator is supposed to clean clothes received from the customers. The layout is as shown in figure 3 below

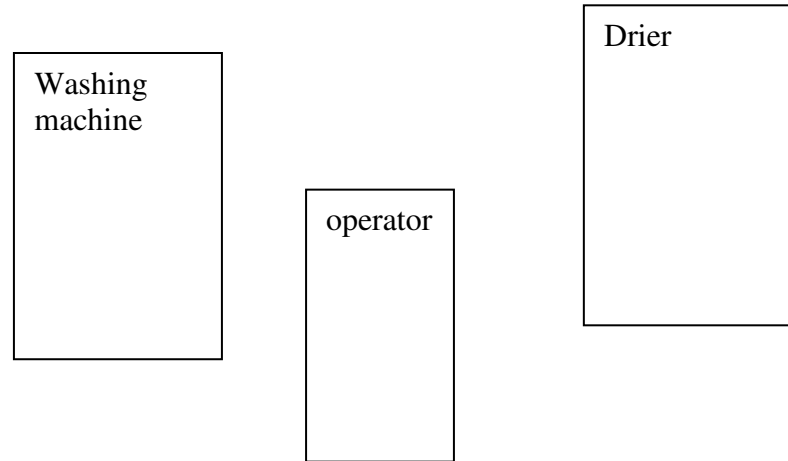


Figure 3 Operator in dry cleaner

- As an Engineering student, develop a Multi activity chart for the operator so that efficiency can be improved. (8 marks)
- b) Explain the following terms
- i. Cyclo graph (2 marks)
 - ii. Micro chronometer (2 marks)
- c) Describe how travel chart can be used in shop floor (8 marks)

QUESTION FOUR (20 MARKS)

- a) Operator is supposed to produce a shaft of 20 mm in diameter in a lathe machine. The specification of the shaft is as shown in figure 4

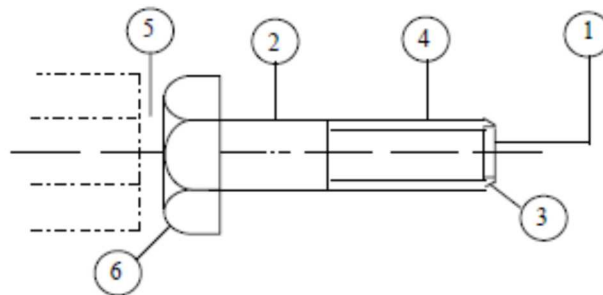


Fig 4 shafts

Operation on the shafts are represented by 1 is end facing, 2 is turning, 3 is chamfering, 4 thread cutting, 5 is parting off and 6 is chamfer cut. Using these information, develop process chart (8 marks)

- b) Describe any three techniques use in work measurement (6 marks)
- c) Describe in detail how string diagrams can be applied in shop flow in layout design (6 marks)

QUESTION FIVE (20 MARKS)

- a) Explain six steps adopted in carrying out work sampling (6 marks)
- b) Describe any three factors considered while conducting method of study (6 marks)
- c) In a welding shop, a direct time study was done on a welding operation as shown in Table 2. One inexperienced industrial engineer and one experienced industrial engineer conducted the study simultaneously. They agreed precisely on cycle time but their opinion on rating the worker differed. The experienced engineer rated the worker 100% and the other engineer rated the worker 120%. They used a 10% allowance.

Table 2 Welding cycle time

Cycle time in minutes	Number of observation
20	2
24	1
29	1
32	1

From the above statement,

- i. Determine the standard time using the experienced industrial engineer's worker rating (4 marks)
- ii. Find the standard time using the worker rating of inexperienced industrial engineer (4 marks)