

Roll No. 

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## ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. / B. Tech / B. Arch (Full Time) - END SEMESTER EXAMINATIONS, April/May 2024

INDUSTRIAL ENGINEERING  
IV Semester  
IE5401 & WORK SYSTEM DESIGN

(Regulation 2019)

Time: 3hrs

Max. Marks: 100

CO 1	Understand the concepts of work study productivity and productivity measurement approaches
CO 2	Record and analyze selected tasks using different flowcharts
CO 3	Apply method-study to improve a task. Apply principles of motion economy to improve performance
CO 4	Conduct a time study to improve the efficiency of the system.
CO 5	Estimate the standard times to assess the office work condition

BL - Bloom's Taxonomy Levels

(L1 - Remembering, L2 - Understanding, L3 - Applying, L4 - Analysing, L5 - Evaluating, L6 - Creating)

PART- A (10 x 2 = 20 Marks)  
(Answer all Questions)

Q. No	Questions	Marks	CO	BL
1	List the factors affecting Productivity.	2	1	L1
2	Write down the steps involved in work study?	2	1	L1
3	List out the combination of primary and secondary questions in the critical examination	2	2	L2
4	Differentiate Effective and ineffective therbligs with examples.	2	2	L2
5	Distinguish between constant and variable element.	2	3	L2
6	Find the determination of the percentage idle time of a turner by work sampling assuming the desired confidence level to be 95% , the error is +5% and observations to be 500?	2	3	L3
7	If MOST work sequence code would look like this: A <sub>1</sub> B <sub>0</sub> G <sub>1</sub> A <sub>1</sub> B <sub>0</sub> P <sub>3</sub> A <sub>0</sub> , calculate the cycle time for the work	2	4	L2
8	Briefly define the Merrick Differential Piece-Rate System.	2	4	L1
9	List the objectives of Organization and Method (O&M).	2	5	L1
10	State the importance of method study in office?	2	5	L1

PART- B (5 x 13 = 65 Marks)  
(Restrict to a maximum of 2 subdivisions)

Q. No	Questions	Marks	CO	BL
11 (a)	How the total work content of manufacturing a component is made up? Explain the Excess time and Ineffective time due to shortcomings on the part of the management and workers and how management techniques can reduce the Excess time and Ineffective time due to shortcomings on the part of the management.	13	1	L3
11 (b) (i)	Explain the Total productivity model, Productivity Index model and APC model	7	1	L3

OR

ii) Long Beach Bank employs three loan officers, each working eight hours per day. Each officer processes an average of five loans per day. The bank's payroll cost for the officers is Rs 820 per day, and there is a daily overhead expense of Rs 500.

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- Compute the labor productivity.
- Compute the multifactor productivity, using loans per dollar cost as the measure.

The bank is considering the purchase of new computer software for the loan operation. The software will enable each loan officer to process eight loans per day, although the overhead expense will increase to Rs 550.

- Compute the new labor productivity.
- Compute the new multifactor productivity.
- Should the bank proceed with the purchase of the new software? Explain.

12 (a) A Multi-Specialty hospital in Mumbai follows certain systematic way of serving Lunch in a hospital ward. The hospital's ward containing 15 beds. When dinners were served by the nurse in charge of the ward fetched a large tray bearing the first course, together with the plates for the patients, from the kitchen. The food was usually contained in three dishes two of which held vegetables and the third the main dish. The nurse placed the tray on the table marked serving table. She set the large dishes out on the table, served one plate with meat and vegetables and carried it to bed. She returned to the serving table and repeated the operation for the remaining 14 beds. When she served all the patients with the first course, she returned to the kitchen with the tray and the empty dishes, collected the dishes and plates for the second course and returned to the ward. She then repeated the complete operation, replacing the plates -emptied by the patients with plates containing their second course and returning the used plates to the serving table, where she stacked them. Finally, she made a tour of the ward, collecting up the empty plates from the second course, and carried everything on the tray back to the kitchen. Identify which type of chart can be used for the current method and draw the identified chart?

OR

12 (b) Discuss the principle of motion economy with examples.

13 2 L3

13 (a) The Manager of a custom manufacturer has just received a production schedule for an order for 30 large turbines. Over the next five months, the company is to produce 2,3,5,8 and 12 turbines respectively. The first unit took 30,000 direct labour hours and experience on past project indicates that a 90% learning curve is appropriate; therefore, the second unit will require only 27,000 hours. Each employee works an average of 150 hours per month. Estimate the total number of full-time employees needed each month for the next five months.

13 2 L3

ii) Explain any three types of performance rating system

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OR



13 (b) A post office mail room receives mail and cancels the postage stamps. After first simplifying work, you make the direct time study of the simplified job and obtain the following times in minutes (table 13.1):

13 3 L3

Table 13.1 Cycle time

Task	Description	Cycle Time				
		1	2	3	4	5
1	Empty mails bags	0.16	0.31	0.14	0.15	0.16
2	Straighten mail	0.60	0.60	0.60	0.60	0.60
3	Carry trays to reader	0.34	0.36	0.35	0.37	0.38
4	Cancellation Machine	0.50	0.50	0.50	0.50	0.50
5	Empty Trays	0.24	0.24	0.48	0.27	0.25

The following information about this job:

Task 2 and 4 are machine controlled. The operator at 120 percent rating when he was working. Management and the workers union have negotiated the following allowances for this job: Personal – 30 minutes per 8 -hour shift, fatigue – 10 minutes, unavoidable delay -40 minutes per 8-hour shift. How many pieces should each operator produce an 8 -hour shift?

14 (a) Furtado Engineering works wants to introduce Rowan Scheme and Halsey plan with the intention of enhancing production. The standard time for to production of an item is 16 minutes per piece. The eight-hour day has 400 working minutes. What would be to earnings of the operator given the present wage rate of Rs 11.40 per hour, if he produced 30,40,60 and 70 units in a day. Find the earnings using Halsey plan?

13 4 L3

OR

14 (b) In a binding press, binding of large size books consists of the following operations.

1. stitching of the pages
2. Trimming the book
3. Cover making
4. joining the book with the cover and finishing.

13 4 L3

The First operation is carried out by Mr.Ramesh and the rest of the operations are performed by Mr.Suresh. It is decided to use time study technique for the first operation and wok sampling method for the rest of the operation. The effective time available per shift is 480 minutes and the number of acceptable book binding done during this period is 8. The details of the time study data of the first operation are shown in table 14 b. The performance rating of Mr.ramesh is 105%.The details of the work sampling data are shown in Table 14c.

Table 14b: Time study data for operation 1

Cycle time	18	19	20	21	22
Frequency	2	3	5	4	1

Table 14c: Work sampling data

Operation	Frequency of performance	Performance rating
2	7	120%



3	21	125%
4	22	95%

Find the standard time of the entire job of book binding per book by assuming an allowance of 10% to all the operations.

15 (a) (i)	Describe the steps in designing a forms control program.	7	5	L2
(ii)	Explain the types of forms used in offices.	6	5	L2
OR				
15 (b) (i)	Illustrate the principles and aspects of organisations and methods.	13	5	L2

**PART- C (1 x 15 = 15 Marks)**  
(Q.No.16 is compulsory)

Q. No	Questions	Marks	CO	BL
16. (i)	Sri sarasvathi Devi bal Vidyalaya conducts several classes on socially useful productive work (SUPW), Which the school uses for meaningful and useful to school work. The annual school function is approaching and hundreds of badges are being prepared by students in the SUPW classes. A continuous stop -watch time study has come up with the findings given in the table below.	15	3	L5

**Table 16.1: Data recording for all the elements**

Element	Cycle Time (min) (observations)										A:0.0.63-0.72: looks at the other girl to check own procedure
	1	2	3	4	5	6	7	8	9	10	
Cut Ribbon	0.10	0.82 <sup>A</sup>	1.47	2.10	2.93 <sup>B</sup>	3.56	4.43	5.09	5.72	6.57	B: 2.62-2.82 stretches hands
Stick Ribbon	0.36	1.09	1.72	2.34	3.20	3.83	4.71	5.35	6.18 <sup>D</sup>	6.84	C:4.10-4.32: pokes her finger accidentally with the pin; sucks her finger
Pin	0.63	1.36	2.00	2.62	3.45	4.32 <sup>C</sup>	4.99	5.61	6.46	7.11	D:5.72-5.92: stops for momentary rest

The Overall rating is 120 percent. If fatigue, personal and other allowances given for the children constitute 30% how many badges can a child be expected to make in an hour?

