KUMARAGURU
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Register Number: ……..

M.E. DEGREE EXAMINATIONS: APRIL / MAY 2023

(Regulation 2018)

Second Semester

INDUSTRIAL ENGINEERING

P18IET2006**:** Work Design and Human Factors Engineering

COURSE OUTCOMES

CO1 Analyze situations to enhance productivity and design jobs.

CO2 Apply work study procedures and analyze outcomes.

CO3 Apply time study procedures to determine standard time and propose O&M procedures.

CO4 Analyze human performance involving ergonomic considerations.

CO5 Analyze ergonomic factors in design of displays and controls.

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions: -

PART A (10 x 1 = 10 Marks)

1. Office work that is not standardized is measured using the technique of: CO3 [K_2]

   a) Work sampling b) Time study

   c) Method study d) Work measurement

2. Method study and work measurement are the two broad components of: CO2 [K2]

   a) Organization & Methods b) Work study

   c) Time study d) Work sampling

3. Consider the following statements with reference to Production: CO1 [K4]

   1. Production is the volume of output considering the quantity and quality of resource employed to achieve that level of output

   2. Production is the volume of output achieved using minimum resource without considering the quality of resource

   3. Production is the volume of output achieved using minimum resource by considering the quality of resource

   4. Production is the volume of output irrespective of quantity and quality of resource employed to achieve that level of output

   Which of these statements are incorrect?

   a) 1,2,4 b) 2,3,4

   c) 1,2,3 d) 3,4

4. Work study of office work is the content covered under: CO3 [K2]

a) Micro motion study b) Cycle graph

c) SIMO chart d) Organization & Methods

5. The Hawthorne experiment that aimed at finding out the relationship between productivity and various variables like incentive system, work pause, method of payment etc. is: CO4 [K2]

a) relay room experiment b) illumination experiment

c) bank wiring room experiment d) incentive experiment

6. The steps in the method study process are shown. CO2 [K3]

1. The new method is Installed and maintained
2. A new method is developed
3. The detail of each job is questioned
4. The operations of the job are broken down

Which is the correct sequence of steps?

a) 1-3-4-2 b) 4-3-2-1

c) 4-2-1-3 d) 3-2-1-4

7. Match list I (rating system) with list II (characteristic) and select the correct answer using the codes given below the lists. CO3 [K3]

List I	List II
A. Westing house system	1. Only human effort is measured
B. Bedaux system	2. Consider four factors (skill, effort, conditions, consistency)
C. Objective rating	3. Considers two aspects namely pace (operators speed) and operators' difficulty
D. Synthetic rating	4. Uses predetermined motion time standards

	A	B	C	D
a)	3	1	2	4
b)	2	3	1	4
c)	2	1	3	4
d)	4	2	3	1

8. Match list I and II and select the correct answer using the codes given below the lists. CO3 [K4]

List I	**List II**
A. Average time	1. Average of different time readings of same activity
B. Rating factor	2. Percentage of efficiency of representative worker
C. Standard time	3. Amount of time required to complete a unit of work
D. Basic time	4. Amount of time required to complete a unit of work at a standard pace with no allowance

	A	B	C	D
a)	3	2	4	1
b)	4	3	2	1
c)	2	4	1	3
d)	1	2	3	4

9. Assertion (A): In many situations where decisions have to be taken, colour plays a vital role in guiding people to take decisions. CO5 [K4]

   Reason (R): There is an inclination in people to sense colours and connection them with functions.

   a) Both A and R are Individually true, and R is the correct explanation of A
   b) Both A and R are Individually true, but R is not the correct explanation of A
   c) A is true but R is false
   d) A is false but R is true

10. Assertion (A): The concepts in "Anthropometry", state that "nobody is 'average' in all body dimensions. CO4 [K4]

    Reason (R): If something is designed for someone, it will only be suitable for people who are of the same size and shape as that someone, and all others will be 'designed out'.

    a) Both A and R are Individually true, and R is the correct explanation of A
    b) Both A and R are Individually true, but R is not the correct explanation of A
    c) A is true but R is false
    d) A is false but R is true

PART B (10 x 2 = 20 Marks)

11. In which situation performance rating factor will be equal to one in time study. CO3 [K4]
12. "Standardizing processes improves productivity" – Give an application. CO1 [K3]
13. In work sampling why are observations made in random intervals? CO3 [K4]
14. "Safety first – Everything else next" – why is it so in the study Industrial Engineering? CO1 [K4]
15. Differentiate the terms "productivity and production". CO1 [K4]
16. Draw a two-handed process chart for assembling a nut and a bolt. CO2 [K3]
17. State the purpose of adding the "allowances component" while calculating standard time to do a work in time study. CO3 [K4]
18. State a work that falls under the scope of O&M. CO3 [K3]
19. State one application of Ergonomics and its impact on productivity. CO4 [K2]
20. Give one application for displays and controls on an automobile. CO5 [K3]

PART C (6 x 5 = 30 Marks)

21. Represent the connection between "productivity and standard of living" with a block diagram and needful rationalization. CO1 [K4]
22. "Method study" – list the steps in the process with applications. CO2 [K3]
23. In the process of work measurement explain the impact of "qualified worker, normal pace and specific job" with suitable analysis. CO3 [K3]
24. List the form design principles and design a form using the principles to apply for "On duty" to attend an external event as a student in an academic institution. CO3 [K3]
25. Enumerate the "environmental factors that influence human performance" with suitable cases. CO4 [K3]
26. Justify any two displays and controls available on an ATM used by banks to serve the customers. CO5 [K3]

Answer any FOUR Questions

PART D (4 x 10 = 40 Marks)

27. State and analyze the eight foundations of Job design criteria with applications. CO1 [K4]
28. Draw a table of symbols used to create process charts and prepare a flow diagram. CO2 [K3]
29. For a job involving two elements, time study was performed. Five cycles were observed and the stopwatch reading using the absolute timing method are provided: CO3 [K3]

Element	Stopwatch reading in minutes				
	1	2	3	4	5
1	08	09	11	08	10
2	32	30	29	30	28

Find the standard time for the job for the following data:

- For the two elements (on the rating scale, 100 corresponding to normal performance) the rating factors were estimated to be 90 and 95 respectively.
- Allowances amount to 15%.

30. State the personal factors that affect human performance in physical work and describe each factor with appropriate applications. CO4 [K3]
31. State and analyze with applications the concept of "design for maintainability". CO5 [K3]

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