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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

August 2024 Semester End Main Examinations

Programme: B.E. **Semester: IV**
Branch: Industrial Engineering & Management **Duration: 3 hrs.**
Course Code: 23IM4PCINE **Max Marks: 100**
Course: Industrial Engineering and Ergonomics

Instructions: 1.Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		UNIT – I	CO	PO	Marks
1	a)	Define Productivity. Give an example each to explain how you could measure the Productivity of Materials, Land, Building, machine and Energy. Mention clearly the units of measurement for each of the types listed above.	*CO 1*	*PO 1*	**10**
	b)	Give the standard definition of the term "Industrial Engineering" Discuss briefly the Scope & evolution of the field of industrial engineering starting from the traditional idea of industrial engineering to the concept behind Modern Industrial Engineering.	*CO 1*	*PO 1*	**10**
		UNIT – II			
2	a)	Define Method Study. With the help of a logically organized flow chart, outline the procedure involved for conducting a Method Study Investigation in an Industrial or Factory setting.	*CO 2*	*PO 1*	**10**
	b)	Record the following activity from the workers point of view on a Standard Flow Process Chart (Man Type), the activity relates to collecting materials from the Inventory stores. Provide summary snap shot of the activity of the worker with a count of the symbols used in the flowchart along with the Time involved and total distance moved. • Preparation of the material requisition slip by the Foreman (Charge hand) – 2 min. • Worker collects the requisition – 0.05 min. • Walks a distance of 100 feet to the location of supervisor. • Hands over the requisition to the supervisor -0.05 min. • Supervisor affixes the signature. • Collects signed copy of the requisition -0.05 min. • Walks to the location of stores -500 feet. • Hands over the requisition slip to the storekeeper -0.03 min. • Waits for the storekeeper to gather materials as per the list in the requisition- 10.0 min.	*CO 3*	*PO 3*	**10**

			• Checks the materials handed over against the requisitions – 3 min. • Collects the material. • Walks with the material to the Machine shop- 500 feet.			
			OR			
	3	a)	Record the operations involved in inspection of catalyst in a converter involving the following technicians Electrician & mate, Fitter & mate Rigger and Process worker, using the standard format of Multiple activity chart. The following are the activities involved and time taken. • The Electrician and the mate work on removing the heaters by taking about 45 minutes. • The electrician and the mate carry out the repairs in the workshop for about 90 minutes. • When the repairs are ongoing the Fitter and his mate release the top by taking about 45 minutes. • The rigger helps in fixing the tackle 5 minutes, while the fitter and mate release the top and this involves approximately 15 minutes. • Once the top is released the fitter and his mate along take the support of the rigger to remove the heavy cast iron top by taking 20 minutes. • Even while the repairs are ongoing and about 10 minutes to go for its completion, the process workers inspect or adjust the catalyst by taking about 60 minutes. • Once the inspection is over, the team of the fitter and the mate along with the rigger replace the heavy cast iron top by taking 15 minutes. • Once the top is removed the rigger releases the tackle by taking about 5 minutes. • The fitter and is mate then do the activity of Securing the top by taking about 75 Minutes. • Finally the electrician and his mate take about 90 Minutes to replace the heaters. As per this present method the entire activity of inspection of the catalyst involves the four types of technicians and a total of 6 Hours of time is spent for one cycle of inspection of the catalyst. Critically examine your recording of the activity using multiple activity charts and propose a new method to use the technicians more effectively for the activity of the inspection of the catalyst. Show the revised multiple activities chart and indicate the savings in the cycle time for the activity of inspection of the catalyst.	***CO 3***	***PO 3***	**15**
		b)	What is a travel chart? Give an example for its usage in the method study investigation.	***CO 1***	***PO 1***	**05**
			UNIT - III			
	4	a)	Define the term work measurement. Outline the basic procedure for the systematic carrying out of work measurement. List out the techniques of work measurement.	***CO 2***	***PO 2***	**10**

		b)	During a time study conducted for 4 Hours, 12 units were completed by a worker and a performance rating of 90 % is given to the worker. Management has decided to give allowances as per following: Contingency -11%, Relaxation- 5% , Inteference-2%, Policy-2% Determine the standard time. Show the steps in the working clearly.	***CO 3***	***PO 3***	**10**
			UNIT – IV			
	5	a)	What are the characteristics of work situations for which work sampling is most suited? The allowance factor for personal time, fatigue & delay (PFD) is to be determined in the machine shop area. If it to be estimated that the proportion of time per day spent in these three categories (personal time, fatigue and delay are grouped together to obtain one proportion) is 0.12., determine how many observations would be required to be 95% confident that the estimated proportion is within ±0.02 of the true proportion?	***CO 4***	***PO 3***	**10**
		b)	Why it is necessary for breaking the job into elements? List these reasons. Give an illustrative example for each of the following types of elements i. An Occasional element. ii. Constant element. iii. Machine elements. iv. Governing elements. v. Foreign elements.	***CO 4***	***PO 1***	**10**
			OR			
	6	a)	What is meant by the acronym WRMSD? List any five of the commonly observed Musculoskeletal disorders in work situations? Are you likely to experience this while using your Smartphone's or your laptops? Why?	***CO 4***	***PO 3***	**10**
		b)	Explain the characteristics of man-machine systems. Explain the functions of machine element in man-machine system. Explain the functions of man element in man-machine system.	***CO 4***	***PO 3***	**10**
			UNIT – V			
	7	a)	Discuss the design aspects of the following display units with reference to the ergonomics: (i) Analogue type display instruments (ii) Digital type display instruments.	***CO 4***	***PO 3***	**10**
		b)	What is the scope of lean manufacturing? List the 6 types of wastes identified using the lean philosophy in any manufacturing plants.	***CO 1***	***PO 1***	**10**

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