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

Autonomous Institute Affiliated to VTU

June 2025 Semester End Main Examinations

Programme: B.E. **Semester: IV**

Branch: Industrial Engineering and 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.

		UNIT - I	*CO*	*PO*	Marks
1	a)	Explain the key stages in the evolution of Industrial Engineering and how each stage contributed to the development of the field.	*CO1*	*PO1*	**10**
	b)	A manufacturing company produces 500 units of a product in a week using 1,000 labor hours. The company also uses 5,000 units of raw material costing ₹10 each and machinery worth ₹1,00,000 (depreciated at 10% annually). Calculate the labor productivity, material productivity, and total factor productivity (TFP). Interpret the results in the context of productivity improvement.	*CO2*	*PO2*	**10**
		OR			
2	a)	A manufacturing firm is facing a decline in productivity despite increasing labor and machine hours. As a productivity consultant, identify and apply at least five relevant factors that could be affecting productivity. Illustrate with practical examples how addressing each factor could improve performance.	*CO2*	*PO2*	**10**
	b)	You are appointed as an Industrial Engineer in a manufacturing company facing low efficiency and high production costs. Apply the principles of work study to identify and explain at least five areas within the organization where work study can be implemented to improve productivity.	*CO3*	*PO3* *PO5* *PO9* *PO12*	**10**
		UNIT - II			
3	a)	Describe the step-by-step methodology used in conducting a method study, highlighting the importance of each step.	*CO2*	*PO2*	**10**
	b)	A simple manual drilling operation involves a worker loading a part, starting the drill, waiting during drilling, and then unloading the part. The drilling machine is idle while the worker loads and	*CO3*	*PO3* *PO5*	**10**

			unloads the part. Apply the concept of a Multiple Activity Chart (MAC) to analyze this process. Draw a chart for one cycle, interpret the results, and suggest one method improvement based on your analysis.		*PO9* *PO12*	
			OR			
	4	a)	A worker is performing a repetitive manual task involving picking up parts from a bin placed on the floor, assembling them on a table, and placing the finished product in a box behind them. Analyze this setup using the principles of motion economy. Identify and explain at least five violations of these principles and suggest corresponding improvements.	*CO3*	*PO3* *PO5* *PO9* *PO12*	**10**
		b)	Explain any four types of charts used to record movements at the workplace. For each chart, describe its purpose and give an example of a situation where it can be applied.	*CO2*	*PO2*	**10**
			UNIT - III			
	5	a)	Explain any four standard techniques of work measurement used in industrial engineering.	*CO1*	*PO1*	**10**
		b)	List and explain the main steps involved in conducting a time study in industrial engineering.	*CO1*	*PO1*	**10**
			OR			
	6	a)	Explain any five factors that affect the rate of working in industrial operations. For each factor, describe its impact on worker performance and productivity.	*CO2*	*PO2*	**10**
		b)	A manufacturing company performs an assembly task that involves 5 operations: loading, assembling, testing, packaging, and inspection. The observed times for these operations, after multiple time study cycles, are as follows: • Loading: 30 seconds • Assembling: 90 seconds • Testing: 60 seconds • Packaging: 50 seconds • Inspection: 40 seconds The standard performance rating is 100%, and allowances (personal, fatigue, and delays) are estimated at 20%. Analyze the given data to determine the standard time for the complete task. Show your working steps clearly and discuss any assumptions made in the process.	*CO3*	*PO3* *PO5* *PO9* *PO12*	**10**
			UNIT - IV			
	7	a)	Describe the key components of a typical ergonomics model based on systems approach.	*CO4*	*PO3*	**10**

		b)	Explain the components of the man-machine system and describe the function of each component. How do these components interact to enhance overall system performance?	*CO4*	*PO3*	**10**
			OR			
	8	a)	Describe the physiological and psychological consequences of prolonged stress. Provide examples of how this stress can affect work performance in industrial settings.	*CO4*	*PO3*	**10**
		b)	List and explain the various areas of study in ergonomics. How do these areas contribute to improving human performance and safety in the workplace?	*CO4*	*PO3*	**10**
			UNIT - V			
	9	a)	Describe the different types of control mechanisms used in the ergonomic design of work systems.	*CO4*	*PO3*	**10**
		b)	Discuss the relationship between controls and displays in the ergonomic design of workstations. How do well-designed controls and displays contribute to improving worker efficiency, safety, and comfort?	*CO4*	*PO3*	**10**
			OR			
	10	a)	Explain the concept of Just-in-Time (JIT) and discuss its relevance in the manufacturing environment.	*CO1*	*PO1*	**10**
		b)	How can the implementation of TQM contribute to improving product quality, customer satisfaction, and operational efficiency in manufacturing?	*CO1*	*PO1*	**10**

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