

**B.Tech. MECHANICAL ENGINEERING  
(COMPUTER INTEGRATED  
MANUFACTURING)**

**Term-End Examination**

**December, 2018**

00033

**BME-035 : INDUSTRIAL ENGINEERING AND  
OPERATIONS RESEARCH**

*Time : 3 hours*

*Maximum Marks : 70*

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**Note :** *Attempt any **four** questions from Section A and any **three** questions from Section B. All questions carry equal marks. Assume any missing data suitably. Use of scientific calculator is permitted.*

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**SECTION A**

*Answer any **four** of the following :*

1. Discuss any **two** of the following topics with reference to the role of the Industrial Engineer in **process improvement** : *2×5=10*
  - (a) Diversification
  - (b) Simplification
  - (c) Standardisation
  - (d) Research and Development

2. What measures would you suggest to improve productivity of a manufacturing firm ? 10
  
3. Consider an example of a worker whose task has been broken into three elements – A, B and C. Four cycles of work were timed and the results of observations are given in Table 1.

Table 1 : Four Cycles of Work and Observations

Job element	Cycle (Observed time in minutes)				Rating
	1	2	3	4	
A	3	4	5	4	105
B	0.5	0.4	0.3	0.5	95
C	2	2	1	2	95

- Calculate the standard time to complete the task, assuming an allowance of 15% on basic time or normal time. 10
4. Explain the requirements of a good product design. 10
  
  5. Define the concept of design for the environment (DFE). Distinguish it from design for sustainability (DFS). 10
  
  6. What do you understand by ergonomic design of products ? Enumerate the general guidelines in designing the display units ergonomically. 10

## SECTION B

Answer any **three** of the following :

7. A firm manufactures two types of products X and Y and sells them at a profit of ₹ 2 on type X and ₹ 3 on type Y. Each product is processed on two machines G and H. Type X requires one minute of processing time on G and two minutes on H. Type Y requires one minute on G and one minute on H. The machine G is available for not more than 6 hours 40 minutes while machine H is available for 10 hours during any working day. Solve this LPP by Graphical method. 10
8. Solve the following transportation problem by Vogel's Approximation Method (VAM) to get the initial basic feasible solution : 10

Distribution Centres (Destination)

		1	2	3	4	Supply
Plants (Origins)	1	2	3	11	7	6
	2	1	0	6	1	1
	3	5	8	15	9	10
Requirement		7	5	3	2	17

9. Define assignment problem. Distinguish between a transportation problem and an assignment problem. How is an unbalanced assignment problem solved? 10
10. Define two-person zero-sum game. Explain the principle of dominance. 10
11. Write short notes on any *two* of the following topics: 2×5=10
- (a) Goal Programming
  - (b) Multi-Attribute Decision Making (MADM)
  - (c) Simulation
  - (d) Queuing Models
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