

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

Term-End Examination

00890

June, 2016

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

Time : 3 hours

Maximum Marks : 70

Note : Attempt four questions from Section A and three questions from Section B. All questions carry equal marks. Assume any missing data suitably.

SECTION A

Answer any four of the following :

1. Explain the productivity of labour, material, machine and land. Also mention the benefits of higher productivity. 10
2. Explain with examples the difference between : 2×5
 - (a) Operation process chart and Flow process chart
 - (b) Flow diagram and String diagram

3. Explain with the help of ergonomic concepts, how can motion economy be ensured in designing a workplace layout. 10

4. A company is planning to introduce an incentive pay scheme in its manufacturing plant. In developing standards for one operation, time study analysts observed a worker for 30 minutes. During that period he produced 42 units. The analyst rated the worker as 130. The base wage rate of the worker is ₹ 50 per hour. The firm has established 15% as fatigue factor.

(a) What is the standard time for the task ?

(b) If the worker produced 500 units during an eight-hour day, what wage would the worker have earned ? 6+4

5. Discuss the industrial design factors affecting product design. 10

6. Write short notes on any *two* of the following : 2×5=10

(a) Standardisation

(b) Performance Rating Methods

(c) Relationship (Rel) Chart

SECTION B

Answer any **three** of the following :

7. Illustrate graphically each of the following conditions in case of LPP :

10

- (a) Unbound solution
- (b) Infeasible solution
- (c) Multiple optimal solution
- (d) Unique optimal solution

8. A company is spending ₹ 1,000 on transportation of its units from three plants to four distribution centres. The supply and demand of units, with unit cost of transportation are given as follows :

		Distribution Centre				Availability
		D ₁	D ₂	D ₃	D ₄	
	P ₁	19	30	50	12	7
Plant	P ₂	70	30	40	60	10
	P ₃	40	10	60	20	18
Requirements		5	8	7	15	

What can be the maximum saving by optimal scheduling?

10

9. A bank has one drive-in counter. It is estimated that cars arrive according to Poisson distribution at the rate of 2 every 5 minutes and that there is enough space to accommodate a line of 10 cars. Other arriving cars can wait outside this space, if necessary. It takes 1.5 minutes on an average to serve a customer, but the service time actually varies according to an exponential distribution. You are required to find
- (a) the probability of time, the facility remains idle,
 - (b) the expected number of customers waiting but currently not being served at a particular point of time, and
 - (c) the expected time a customer spends in the system. 3+4+3
10. Explain the following terms in relation to Game theory : 10
- (a) Two-person zero-sum game
 - (b) Pure strategy
 - (c) Mixed strategy
 - (d) Principle of dominance
11. Write short notes on any *two* of the following decision criteria : 2×5
- (a) Maximax (Optimism) Criterion
 - (b) Minimax Regret Criterion
 - (c) Hurwicz Criterion