

**INDUSTRIAL ENGINEERING
(MECH 3224)**

Time Allotted : 2½ hrs

Full Marks : 60

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
any 4 (four) from Group B to E, taking one from each group.*

Candidates are required to give answer in their own words as far as practicable.

Group – A

1. Answer any twelve:

12 × 1 = 12

Choose the correct alternative for the following

- (i) At the breakeven point
 - (a) Total cost is more than the sales revenue
 - (b) Total cost is less than the sales revenue
 - (c) Total cost is equal to sales revenue
 - (d) Fixed cost is equal to variable cost
- (ii) The aim of value engineering is to
 - (a) Find the depreciated value of a machine
 - (b) Determine the selling price of a product
 - (c) Minimize the cost without change in quality of the product
 - (d) Maximize the cost with change in quality of the product
- (iii) The production cost per unit can be reduced by
 - (a) Producing more with increased inputs
 - (b) Eliminating idle time
 - (c) Producing more with the same inputs
 - (d) Minimizing resource waste
- (iv) The disadvantages of product layout is
 - (a) Skilled labour to operate machines
 - (b) High initial investment for the specialized facilities
 - (c) Production time is longer, requiring more goods in inventory
 - (d) High cost of inspection
- (v) For a product layout, the material equipment must
 - (a) Have full flexibility
 - (b) Employ conveyor belts, trucks, tractors etc.
 - (c) Be a general purpose type
 - (d) Be designed as special purpose for a particular application
- (vi) In ship manufacturing, the type of layout preferred is
 - (a) Product layout
 - (b) Process layout
 - (c) Combination layout
 - (d) Fixed layout

- (vii) Which of the following functions of PPC is related to the timetable of activities?
 (a) Scheduling (b) Dispatching
 (c) Expediting (d) Routing
- (viii) The ordering cost per order of an inventory is Rs. 400 with an annual carrying cost of Rs. 10 per unit. The economic order quantity (EOQ) for an annual demand of 2000 units is
 (a) 400 (b) 440 (c) 480 (d) 500
- (ix) Standard time is equal to
 (a) Normal time + Allowance (b) Observed time + Allowance
 (c) Observed time \times rating factor (d) Normal time \times rating factor
- (x) The symbol \Rightarrow in work study is used for
 (a) Operation (b) Inspection
 (c) Delay (d) Transport

Fill in the blanks with the correct word

- (xi) The machines used for mass production are _____.
- (xii) CRAFT and CORELAP are _____ methods used in plant layout design, while Relationship Diagrams primarily focus on analyzing spatial relationships between departments.
- (xiii) One of the key factors in selecting a plant location is the availability of _____.
- (xiv) The primary function of industrial engineering is to improve _____ and efficiency in production systems.
- (xv) Standard time is a function of _____ time and allowance factor.

Group - B

2. (a) The demand for a certain component matches with the desired rate of production and this demand is going to be continued for the forthcoming years. The company has two options, either to get the component manufactured from outside or it can manufacture in-house. It is Rs. 2.80 per unit to buy the component. The in-house manufacture will incur a fixed cost to the extent of Rs. 10,000 and variable cost of Rs.1.50 per unit. Suggest a suitable decision rule by the company whether to make or buy the component. [[CO1](Execute/HOCQ)]
- (b) What is meant by the term 'value engineering'? How do you distinguish between the terms 'value analysis' and 'value engineering'? [[CO1](Analyse/IOCQ)]
6 + (3 + 3) = 12
3. (a) Construct a breakeven chart with the salient points mentioning the significance of breakeven point. [[CO1](Remember/LOCQ)]
- (b) The ABC company is investigating the decision whether to make or buy a plastic packaging which is currently being purchased at Rs. 7 each. The demand estimates are shown below.

Demand (Units)	20,000	30,000	40,000	50,000	60,000
Chance (%)	10	30	40	15	5

The decision to manufacture in-house costs the company an annual fixed cost of Rs. 80,000 towards renovation and conditioning variable costs are estimated at Rs. 5 per unit. Give your decision whether to make or buy. At what quantity it is profitable to produce rather than buy.

[[C01](Remember/LOCQ)]

6 + 6 = 12

Group - C

4. (a) Name any six factors which must be considered while selecting the location of the factory. [[C03](Understand/LOCQ)]
 (b) State any four objectives of plant layout. [[C03](Remember/LOCQ)]
6 + 6 = 12

5. (a) Explain the various terms associated with line balancing. [[C04](Remember/LOCQ)]
 (b) Define process planning. What are the factors that influence process planning? [[C04](Remember/LOCQ)]
6 + (2 + 4) = 12

Group - D

6. (a) Explain the purpose of maintaining inventory in a production unit. [[C03](Understand/LOCQ)]
 (b) The John Equipment Company estimates its carrying cost at 15% and its ordering cost at Rs. 9 per order. The estimated annual requirement is 48,000 units at a price of Rs. 4 per unit. What is the most economical number of units to order? How many orders should be placed in a year? [[C03](Evaluate/HLOCQ)]
6 + 6 = 12
7. (a) You own a factory and make steel furniture as and when orders are received from customers. Describe the procedure you would follow for planning and control of production in your factory. [[C03](Analyse/IOCQ)]
 (b) The Maha cutley outlet sells dinner sets. It provides the following information's:
 Maximum demand: 200 per week
 Average demand: 160 per week
 Minimum demand: 145 per week
 Maximum lead time: 2 weeks
 Average lead time: 1.5 weeks
 Minimum lead time: 1.35 weeks
 Re-order quantity: 500 dinner sets
 Compute the maximum level, minimum level and re-order level of stock of Maha cutley outlet using above information. [[C05](Evaluate/HOCQ)]
6 + 6 = 12

Group - E

8. (a) What are the various types of allowances used in calculation of standard time? [[CO6](Understand/LOCQ)]
- (b) An operator was kept under observation for 20 days. He was found working on 900 occasions and abstaining including idle time was 100. He produced 250 jobs during these days. The observation per day was for 5 hours only and the total number of observations was 1000. Take 110 as performance rating for operator and 20 per cent as allowance. Calculate the standard time. [[CO6](Evaluate/IOCQ)]
- (c) What is difference between micro-motion and memo-motion study. [[CO6](Understand/LOCQ)]
- 3 + 6 + 3 = 12**
9. (a) What are the objectives of conducting a time study? [[CO6](Understand/LOCQ)]
- (b) The following data is available for a machine in a manufacturing unit:
- | | |
|---------------------------------------|--------|
| Number of hours worked per day | 8 |
| Working days per month | 25 |
| Number of operators | 1 |
| Standard time per unit of production, | |
| Machine time | 22 min |
| Operator time | 8 min |
| Total time/unit | 30 min |
- (i) If plant is operated at 75% efficiency, and the operator is working at 100% efficiency, what is the output per month?
- (ii) If the machine productivity is increased by 10% over the existing level, what will be the output per month?
- (iii) If the operator efficiency is reduced by 20% over the existing level, what will be the output per month? [[CO6](Analyse/IOCQ)]
- (c) Write short notes on “multiple activity chart” and “SIMO chart”. [[CO6](Understanding/LOCQ)]
- 2 + 6 + 4 = 12**

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	50	31.25	18.75