INDUSTRIAL ENGINEERING
(MEC3124)

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) Which of the following layout is suited for mass production?
(a) Process layout (b) Product layout
(c) Fixed position layout (d) Plant layout

(ii) With respect to fixed costs, cost-volume-profit (CVP) analysis assumes total fixed costs
(a) Per unit remain constant as volume changes
(b) Remain constant from one period to the next
(c) Vary directly with volume
(d) Remain constant across changes in volume

(iii) 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

(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) In a continuous type of production, factories adopt
(a) Product layout (b) Process layout
(c) Combined layout (d) Fixed position layout

(vi) The ordering cost per order of an inventory is Rs. 500 with an annual carrying cost of Rs. 20 per unit. The economic order quantity (EOQ) for an annual demand of 4000 units is
(a) 400 (b) 440 (c) 480 (d) 447

(vii) Under which of the following circumstances single storey building is preferable over multi-storey building in the context of plant location and plant layout?
(a) When materials can be handled by gravity feed
(b) When the material handling is difficult because the product is heavy
(c) When the acquisition of land becomes difficult and expensive
(d) When the floor space is less

(viii) The correct sequence of operations in the production planning and control process is
(a) Routing- scheduling- follow up - dispatching
(b) Scheduling-follow up- dispatching-routing
(c) Routing-scheduling-dispatching-follow up
(d) Dispatching-routing-scheduling-follow up

(ix) Standard time is equal to
(a) Normal time + Allowance
(b) Observed time + Allowance
(c) Observed time × rating factor
(d) Normal time × rating factor

(x) The percentage of idle time of a worker can be found by
(a) Time study
(b) Method study
(c) Stopwatch
(d) Work sampling

Fill in the blanks with the correct word

(xi) The main objective of value engineering is to achieve the required function at the lowest possible _____.

(xii) Assembly line production is a typical example of _____ layout.

(xiii) The stock level at which a new order is placed is called _____ level.

(xiv) The objective of line balancing is to minimize _____ time.

(xv) _____is a photographic aid for method study.

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. *[(CO2)(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. *[(CO2)(Understand/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. *[(CO2)(Execute/HOCQ)]*

6 + 6 = 12

Group - C

4. (a) Discuss the various concepts and measures involved in line balancing. *[(CO3)(Analyse/IOCQ)]*

(b) Define process planning. What are the factors that influence process planning? *[(CO2)(Remember/LOCQ)]*

6 + (2 + 4) = 12

5. (a) Elaborate briefly on the advantages and disadvantages of single-storey and multi-storey factory buildings. *[(CO3)(Analyse/IOCQ)]*

(b) Discuss the role of quantitative methods such as CRAFT, CORELAP and relationship diagrams in the design and optimization of plant layouts. *[(CO3)(Analyse/IOCQ)]*

6 + 6 = 12

Group - D

6. (a) What is meant by economic order quantity (EOQ)? Develop a relationship between EOQ in terms of ordering cost, carrying cost and cost per piece. *[(CO5)(Analyse/IOCQ)]*

(b) ABC Corporation currently practices the following system for the procurement of an item. No. of orders placed in a year = 8, ordering cost = Rs. 750/order, each time order quantity = 250, carrying cost = 40 percent. Comment on the ordering policy the company and estimate the loss to the company in not practising scientific inventory policy. *[(CO5)(Execute/HOCQ)]*

(2 + 4) + 6 = 12

7. (a) Discuss the objectives of maintaining inventory in production industries. *[(CO5)(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? *[(CO5)(Evaluate/HOCQ)]*

6 + 6 = 12

Group - E

8. (a) What is productivity? What are the factors leads to an improvement in productivity? *[(CO6)(Understand/LOCQ)]*

   (b) There are two industries manufacturing two types of plugs. The standard time per piece is 1.5 minutes. The output of the two industries is 300 and 200, respectively per shift of 8 hours.
   (i) What is the productivity of each per shift of 8 hours?
   (ii) What is the production of each per week (6 days) on the basis of double shift? *[(CO6)(Evaluate/IOCQ)]*

   (c) Discuss the steps of work sampling. *[(CO6)(Remember/LOCQ)]*

(1 + 4) + 4 + 3 = 12

9. (a) What is work sampling? What are its merits and limitations? *[(CO6)(Understand/LOCQ)]*

   (b) A work study was conducted in a machine shop. The data has been recorded.
   Total number of observations = 2000
   No activity = 500
   The ratio between manual to machine = 3:1 portion of the activities
   Average performance rating = 85%
   Total number of pieces produced = 120 during study
   Duration of the study = 60 hrs.
   Calculate the standard time/piece assuming 15% relaxation allowance. *[(CO6)(Evaluate/HOCQ)]*

(1 + 4) + 7 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	32.29	35.42	32.29