

8. Write short notes on any *four* :

$2 \frac{1}{2} \times 4$

- (i) Safety stock
- (ii) Economic Batch Quantity
- (iii) Crashing of Project Network
- (iv) Quality Circle
- (v) Simple queuing model.

**Set-1**

**INDUSTRIAL ENG. AND OPERATION  
RESEARCH**

Full Marks : 70

Time : 3 hours

Answer any **six** questions including **Q. No. 1**  
which is compulsory

*The figures in the right-hand margin indicate marks*

1. Answer the following questions :  $2 \times 10$

- (a) Distinguish between routing and scheduling.
- (b) What do you mean by dispatching ?
- (c) What is EOQ-model ?
- (d) What do you mean by ABC analysis ?
- (e) Distinguish between PERT and CPM.

(f) What is a critical path in a project network and what does it determine?

(g) What do you mean by Kaizen? State three key elements of Kaizen.

(h) What is a Kanban system? State and briefly explain the two types of Kanbans.

(i) What is total quality management and what are its benefits?

(j) What does ISO-9000 series mean and what are the benefits provided by the series?

2. (a) Explain the objectives of production planning and control. 5

(b) Explain the terms routing, scheduling and dispatching. 5

3. (a) What are the relevant costs associated with an inventory? Explain. 4

(b) The supply of a special component has the following price scheduling: 6

0 to 99 items : Rs. 1,000 per unit  
100 items and above : Rs. 950 per unit

The inventory holding costs are estimated at 25% of the value of the inventory. The procurement ordering costs are estimated at Rs. 2,000 per order. If the annual requirement of the component is 300 units compute the economic order quantity for the procurement of these items.

4. Consider the following data of a project :

Activity	Normal Time (Weeks)	Normal Cost (Rs.)	Crash time (weeks)	Crash cost (Rs.)
1-2	13	700	9	900
1-3	5	400	4	460
1-4	7	600	4	810
2-5	12	800	11	865
3-2	6	900	4	1130
3-4	5	1000	3	1180
4-5	9	1500	6	1800

If the indirect cost per week is Rs. 250, find the optimal crashed project completion time. 10

( 4 )

5. A company produces two products  $X$  and  $Y$ , both of which require a particular raw material and a particular machine product  $X$  requires 4 machine hours and 3 kg of raw material per unit of product and product  $Y$  requires 2 machine hours and 6 kg of raw materials per unit of product. Suppose that the availability of the raw materials and machine hours is limited. The raw material is available to the maximum extent of only 240 kg per month and the machine hours are available to a maximum extent of only 200 machines hours per month. Each of the products  $X$  and  $Y$  contribute to the profit margin by Rs. 7 and Rs. 9 respectively per unit of product. Formulate this as an LP problem and solve by graphical method to determine the units of each product to be produced for maximisation of profit. Also find the dual of the primal LP problem. 8 + 2
6. Consider the transportation problem having the following cost and requirements table :

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( Continued )

( 5 )

	Destination				Supply	
	1	2	3	4		
Source	1	5	8	3	6	30
	2	4	5	7	4	50
	3	6	2	4	5	40
Demand	30	20	40	30		

- (a) Use North-West corner rule to obtain an initial basic feasible solution for this problem. 2
- (b) Use Vogel's approximation method to obtain an initial basic feasible solution 4
- (c) Obtain an optimal solution. 4
7. Given the following table of distances, solve the travelling salesman problem (a special type of routing problem) : 10

City ↓	1	2	3	4	5
1	$\infty$	2	14	8	6
2	4	$\infty$	12	6	8
3	2	12	$\infty$	4	2
4	2	10	8	$\infty$	12
5	14	10	8	10	$\infty$

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( Turn Over )

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