

- N.B. : (1) Answer any three question from Section I.
 (2) Section II is compulsory.
 (3) Maximum marks for each question are indicated on the right side of the question.

Section I

1 a) Explain the exponential smoothing method of forecasting. Why the method is called 'Exponential'?

4 Marks.

b) Following data is available about the "Actual Sales quantities" for the past 12 years.

Year	1	2	3	4	5	6	7	8	9	10	11	12
Sales	75	80	98	128	137	119	102	104	100	102	82	73

Find the forecast for the year 13 using "Five Years" as well as "Four Years" moving averages. Which of the two forecasts is more reliable using the MSE criterion?

6 Marks.

2a) What are the different kinds of capacities? Is it possible to exceed 100% capacity utilization?

4 Marks.

b) A machine operator has to perform two operations, Milling and Grinding, on a number of jobs. The time required in minutes for each of these jobs is as given in the below table,

Job	Time for Milling (Mins)	Time for Grinding (Mins)
1	4	7
2	14	8
3	6	10
4	3	8
5	10	2
6	12	1

fig 6.3

Determine the order in which the jobs should be processed in order to minimize the total time to complete all the jobs. Also find the total processing time (cycle time) and the machine idle time and job waiting time. (Job waiting time is the time the job waits in between processing. If the job has not been processes on the first machine then the same cannot be considered as job waiting time.)

6 Marks.

3 a). If Operation planning and control also applicable to services? Discuss this in detail. 4 Marks.

b) For the given predecessor relationship & task time in minutes, find out the cycle time, theoretical minimum number of workstations and the efficiency of the assembly line. Use the longest operation time for line balancing

Task	Precedence Requirement	Task Time (mins)
A	---	40
B	A	80
C	D, E, F	30
D	B	25
E	B	20
F	B	15
G	A	120
H	G	145
I	H	130
J	C, I	115

6 Marks.

4) a) Bring out the subtle differences between the P – system of inventory management & Q – system of inventory management. Which class of inventory is best suited for P – system?

4 Marks.

b) Exide batteries is offering discounted prices to retailers for the following quantities of car batteries.

<u>Number of Units</u>	<u>Price (Rs / unit)</u>
50 ~ 99	2,000
100 ~ 149	1,900
>150	1,800

A retailer of the company at Jhansi has an annual demand of 2500 units. The carrying cost of batteries is estimated by the retailer according to past experiences as 10% of the inventory value and the ordering cost is estimated as Rs 100/- per order. Determine the size of the order the retailer should place with Exide so that the total inventory cost is minimum.

6 Marks.

5) Write short notes (any 2)

10 Marks.

- Conditions under which Johnson's algorithm can be extended to a 3 M/c or a M M/c problem.
- Aggregate Planning.
- Lean Manufacturing.
- Relevance of forecasting errors. Explain Tracking signal.

Section II

An auto component manufacturer was thinking about giving up the supply of a particular part because he was neither able to supply the demanded quantity nor make money out of it. The order was lucrative because it gave their forging business a huge tonnage and turnover, but it was on the machining side that they had problems. The machinery installed to machine the part was imbalanced in cycle times and their thinking did not address the best possible process. The design of the special purpose machine (SPM) installed was poor as it could not provide the torque and thrust required for drilling.

The parts were sent to different vendors for machining. The bronze bush was reamed after fitting into the part, and this operation destroyed the surface finish on the bush and reduced the depth of the oil retainer groove. The result was a struggle to meet the demand, thereby allowing compromises in quality. When you map the processes in discrete organisations, this is not an uncommon scene. When they were helped with some lean thinking, they realised that the price they were paid was fair, but they were really losing money in the following areas:

1. Over-production: Their discrete manufacturing process with its imbalanced cycle times, production lines and uncertainties led them on the path towards producing more than the required quantity. They were pushing rather than applying pull

2. Defects and rework: Their discrete process was not 'mistake proofed'. The process and equipment used allowed deviations to quality requirements, and therefore had to be reworked for corrections where possible.

3. Movement: Men were moving to each vendor location to chase the parts, quality control (QC) inspectors were moving to each vendor location for inspecting the components, vehicles were moving to ferry the parts, not to mention telephone calls, documentation, etc

4. Transportation: To and from the various vendors (people, materials and information)

5. Excessive inventory: Maintained as raw materials and work in progress (WIP) with respect to each vendor, and owing to the uncertainty in their process

6. Over-processing: Their discrete process did not have any capability. So they had to perform operations that were actually not necessary (such as reaming a fully finished bush after fitting it)

7. Waiting time: They had partially finished goods always waiting for instructions or transport to be moved, material waiting for instructions (processing, rework, inspection or movement). The concept of 'task' time or balanced cycle times was not used.

They decided to correct the wrong and meet the demand requirements, which was doubling their existing production, and knowing that demand could quadruple too.

1. Can you advise them on the correct strategy using the techniques learnt in Operations Planning & control?

2. What considerations are involved when a process is outsourced?

3. Which type of layout is best suited for the given problem?

4. Is ABC method of inventory classification applicable in this case?