8E4050

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B. Tech. (Sem. VIII) (Main) Examination, May/June - 2010
Mechanical Engg.
(8ME2 Operations Management)

Time : **3** Hours] [Total Marks : **80**
[Min. Passing Marks : **24**

*Attempt any **five** questions. All questions carry **equal** marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly with valid reasoning. Units of quantities used/calculated must be stated clearly.)*

Use of following supporting material is permitted during examination.

(Mentioned in form No. 205)

1. Nil 2. Nil

1 (a) How is operations strategy related to business strategy? How does operations strategy impact business strategy? **6**

(b) Aroma Drip Coffee Inc. produces commercial coffee machines that are sold all over the world. The company's production facility has operated at near capacity for over a year now. Wayne Conners, the plant manager, thinks that sales growth will continue.

(i) He wants you to develop long range forecasts to help plan facility requirement for the next 3 years. Sales records for the past 10 years have been compiled.

Year	Annual sales (thousands of unit)	Year	Annual sales (thousands of unit)
1	1000	6	2000
2	1300	7	2200
3	1800	8	2600
4	2000	9	2900
5	2000	10	3200

(ii) Wayne Conners is trying to plan cash, personnel and materials and supplies requirement for each quarter of next year. The quarterly sales data for the past three years seem to reflect fairly the seasonal output pattern that should be expected in the future. Estimate quarterly sales for next year.

Year	Quarterly sales (thousand of unit)				Annual total
	Q_1	Q_2	Q_3	Q_4	
8	520	730	820	530	2600
9	590	810	900	600	2900
10	650	900	1,000	650	3200

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OR

1 (a) Define and describe the concept of a product life cycle. For each stage of the product life cycle, give an example of a product that is in that stage.

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(b) Ann Hickman must forecast the sales of her expanding trucking firm so that she can plan cash, personnel and fuel needs in the future. She believes that the sales during the past six-month period should be representative of future sales. Develop an exponential smoothing forecast with trend for sales in Month 7 if $\alpha = 0.2$, $\beta = 0.3$ and past sales in thousand of dollers were :

Month (t)	Sales (thousands of dollers) (A_t)
1	130
2	136
3	134
4	140
5	146
6	150

Use starting forecast for month 1 i.e. $FI_1 = 130 = A_1$ and trend component $T_1 = 4$.

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2 (a) Explain why product-focused systems are sometimes called (i) Continuous production (ii) Production lines or assembly lines. Explain the difference between (i) discrete unit manufacturing and process manufacturing (ii) process-focused production and process manufacturing.

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(b) Three production processes - Automated (A), Cellular manufacturing (C) and Job shop (J) have the following cost structure :

Process	Fixed cost per year	Variable cost per unit
A	$ 110,000	$ 2
C	$ 80,000	$ 4
J	$ 75,000	$ 5

(i) What is the most economical process for a volume of 10,000 units per year?

(ii) At what volume would each of the processes be preferred?

(iii) What is the annual break-even quantity for the automated process (A) if the selling price of the product is $14 per unit?

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OR

2 (a) Name four activities usually involved in any long-range capacity planning decision.

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(b) Biltmore Manufacturing has developed a promising new product. The firm's management faces three choices: It can sell the idea for the new product to a company for $20,000, it can hire a consultant to study the market and then make a decision, or it can arrange financing for building a factory and then manufacture and market the product. The study will cost Biltmore $ 10,000 (ten thousand dollars) and its management believes that there is about a 50-50 chance that a favourable market will be found. If the study is unfavourable, management figures that it can still sell the idea for $12,000. If the study is favourable it figures that

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it can sell the idea for $40000. But even if a favourable market is found, the chance of an ultimately successful product is about 2 out of 5. A successful product will return $ 500000. Even with an unfavourable study, a successful product can be expected about once in every ten new product introductions. If Biltmore's management decides to manufacture the product without a study, it figures there is only a 1 in 4 chance of its being successful. A product failure costs $100000. What should Biltmore do?

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3 (a) Define and describe aggregate planning.

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(b) A firm produces two products A and B on a produce-to-stock basis. The demands for the products come from many sources. The demand estimates for the two products over the next six weeks are given below.

Demands : for A Product A

Sources of Demand	Weekly Demand (no. of products A's)					
	1	2	3	4	5	6
Inter company orders	—	—	—	20	10	10
Branch warehouse orders	—	—	20	—	—	—
R & D orders	—	—	10	10	—	—
Customer demand	20	20	20	20	20	20

Demands : for Product B

Sources of Demand	Weekly Demand (no. of products B's)					
	1	2	3	4	5	6
Inter company orders	—	—	10	—	10	—
Branch warehouse orders	—	—	—	20	—	—
R & D orders	—	—	—	—	10	10
Customer demand	30	30	30	20	20	20

The safety stock is the minimum level of planned inventory. The safety stock for A is 30 and for B it is 40. The fixed lot size for A is 50 and for B is 60. The beginning inventory for A is 70 and for B it is 50. Prepare an MPS for these two products.

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OR

3 (a) What are the objectives of MRP? Explain how each of these objectives is achieved?

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(b) Complete the MRP schedule for the part below

lot size = 1200+ ; Safety stock = 300; Lead time = 2 weeks; Allocated = 150; on hand = 850.

	Week					
	1	2	3	4	5	6
Gross requirement	100	600	400	900	1350	700
Scheduled receipts	500	—	—	—	—	—
Available						
Net requirement						
Planned order receipts						
Planned order releases						

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4 (a) What scheduling decisions must operations managers resolve in product-focused factories?

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(b) A manufacturing company processes 6 different jobs on two machines A and B. No. of units of each job and its processing times on A and B are given in table. Find the optimal sequence, the total minimum elapsed time and idle time for each machine.

Job No	No. of Units of each job	Processing Times Machine A (mts)	Machine B (mts)
1	3	5	8
2	4	16	7
3	2	6	11
4	5	3	5
5	2	9	7.5
6	3	6	14

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OR

4 (a) Describe a process-focused factory. What are the implications of the characteristics of such a factory for scheduling decisions ?

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(b) There are five jobs each of which is to be processed through three machines A, B and C in the order ABC. Processing times in hours are

Job	A	B	C
1	3	4	7
2	8	5	9
3	7	1	5
4	5	2	6
5	4	3	10

Determine the optimum sequence for the five jobs and the minimum elapsed time. 10

5 (a) Explain what is meant by a material with independent demand. Give an example and explain why its demand is independent?

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5 (a) A firm user every year 12000 units of a raw material costing Rs. 1.25 per unit. Ordering cost is Rs. 15 per order and the holding cost is 5% per year of average inventory.

(i) Find the economic order quantity

(ii) The firm follows EOQ purchasing policy.

It operates for 300 days per year. Procurement time is 14 days and safety stock is 400 units.

Find the reorder point, the maximum inventory and the average inventory.

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OR

5 Define these terms :

(i) back logging

(ii) produce-to-order

(iii) product-to-stock

(iv) order quantity

(v) order point

(vi) inventory cycle

(vii) machine changeover

(viii) lot size

(ix) order period

(x) two-bin system

(xi) vendor-managed inventory

(xii) carrying costs

(xiii) ordering costs

(xiv) stock out cost

(xv) annual carrying costs

(xvi) annual ordering costs. **16**
