8E4050

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B. Tech. VIII Sem. (Main/Back) Exam., April, 2015
Mechanical Engineering
8ME2 Operations Management

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 24

Instructions to Candidates:

*Attempt any **five questions**, selecting **one question** from **each unit**. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.

1. NIL 2. NIL

UNIT – I

Q.1 (a) Explain what is meant by the term service revolution? Name five service industries and explain in brief their service types. [6]

(b) A large health maintenance organization (HMO) was created as a result of a corporate merger two years ago. Cindy Belle, the operation manager, needs to develop a staffing plan for the legal department. She wants to use the two years of historical law suit data given below to forecast the number of law suits filed against the company for one month ahead. [10]

Month	No of Lawsuits	Month	No of Lawsuits	Month	No of Lawsuits
1	16	9	51	17	63
2	25	10	56	18	57
3	16	11	67	19	48
4	24	12	45	20	55
5	38	13	53	21	61
6	46	14	61	22	51
7	54	15	55	23	56
8	52	16	69	24	53

(i) Develop moving average forecasts for the past 10 months (months 15 – 24) for AP = 2, 4, 6 & 8 months.

(ii) Which AP results in the lowest mean absolute forecasting error? Which AP would you recommend? Why?

(iii) Using your recommended AP, forecast the number of lawsuits expected for next month (month 25)

OR

Q.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. [6]

(b) A toy company buys large quantities of plastic pellets for use in the manufacture of its products. Production manager Josh Kang wants to develop a forecasting

system for plastic pellet prices. The price per pound of plastic pellets has varied as shown: [10]

Month	Plastic pellets price/pound	Month	Plastic pellets price / pound
1	$0.39	9	$0.35
2	0.41	10	0.38
3	0.45	11	0.39
4	0.44	12	0.43
5	0.40	13	0.37
6	0.41	14	0.38
7	0.38	15	0.36
8	0.36	16	0.39

(i) Use exponential smoothing to forecast monthly plastic pellet prices. Compute what the forecasts would have been for all the months of historical data for $\alpha = 0.1$, $\alpha = 0.3$ and $\alpha = 0.5$ if the assumed forecast for all α's in the first month is $0.39.

(ii) Which alpha value results in the least mean absolute deviation for months 7 – 16?

(iii) Use the best alpha value for part (ii) to compute the forecasted plastic pellets price for month 17.

UNIT – II

Q.2 Discuss different types of Production systems with -

(a) Examples & figure (layouts) [6]

(b) Triveni steels (P) Ltd is planning to start a new factory for manufacturing steel utensils. It is considering three location options, namely Bokaro, Jamshedpur and Bhilai. The fixed costs at the three locations have been estimated at Rs 8.15 million, Rs 7.377 million and Rs 7.903 million, respectively. The variable costs at the three locations are estimated at Rs 500 per unit, Rs 580 per unit and Rs 490 per unit respectively. The factory will have an annual production capacity of 10,000 steel utensils and in the initial years it will operate at 75% efficiency. Find the best location option which has the lowest total cost of production. [10]

OR

Q.2 (a) Name three ways that firms can reduce long – range capacity. Name five ways that firms can expand long – range capacity. [6]

(b) A manufacturing needs to add more production capacity. Two alternatives are now being studied - automated and manual. The information below is important to this decision. [10]

	Automated Process	Manual Process
Annual fixed cost	$ 545,000	$ 123,000
variable cost per product	$ 15.66	$ 17.69
Estimated annual production		
(in no to products): Year 1	120,0000	120,000
Year 5	150,000	150,000
Year 10	220,000	220,000

(i) Which alternative would be the least cost alternative in year 1, 5 & 10?

(ii) How much would the variable cost per unit have to be in year 5 for the automated alternative to justify the additional annual fixed cost of the automated alternative over the manual alternative?

UNIT – III

Q.3 (a) What is materials requirement planning (MRP)? What are the in puts and out puts required by the MRP processing logic? [6]

(b) The central terminal at the Quick Cargo Air Freight company receives air freight from aircraft arriving from all over the United States and redistributes it to aircraft for shipment to all U.S. destinations. The company guarantees overnight shipment of all parcels, so enough personnel must be available to process all cargo as it arrives. The company now has 24 employees working in the terminal. The forecasted demand for ware house workers for the next seven months is 24, 26, 30, 28, 28, 24 & 24. It costs $2,000 to hire and $ 3,500 to lay off each worker. If over time is used to supply labour beyond the present work force straight time capacity, it will cost the equivalent of $2,600 more for each additional worker needed. Should the company use a level capacity with over time or a matching demand plan for the next six months? [10]

OR

Q.3 List the advantages and disadvantages of these traditional aggregate plans: [16]

(a) Matching demand

(b) Level capacity with inventory

(c) Level capacity with back log.

(d) Level capacity with subcontracting.

(e) Level capacity with part time workers.

Give suitable examples.

UNIT – IV

Q.4 Describe how customer – as – participant service operations are planned, controlled analyzed, scheduled and managed. [16]

OR

Q.4 (a) What are routing, dispatching, prioritization and expediting? Explain. [6]

(b) Table 1 gives the processing time (in hours) of seven jobs to be processed on three machines MI, M2 and M3 in the order M1, M2, M3. Sequence the jobs using Johnson's method and find the overall processing time. Find also the waiting times of the jobs and the idle times of the three machines. [10]

Q.5

Table

Job	M1	M2	M3
A	7	6	10
B	10	3	9
C	11	1	15
D	14	2	13
E	21	5	18
F	17	4	11
G	8	1	9

UNIT – V

Q.5 (a) How is the producer's model of inventory different from the retailer's model? Derive an expressive for the EOQ in the producer's model. [6]

(b) If the annual demand for a product is 350,000 units, then the annual carrying cost rate is 25% of the cost of the unit. The product costs $ 14.75 per unit to purchase, and each time the product is ordered the related ordering cost is $ 53.00. [10]

(i) What is the EOQ?

(ii) What is the Total annual Storing Cost (TSC) at the EOQ?

(iii) How much would the TSC increase if the order quantity must be 2500 units because of a standard shipping container size?

OR

Q.5 (a) Why is the ABC classification of items done? How is the ABC distribution curve (Pareto Curve) drawn? [6]

(b) Zen Bicycles Ltd sources 3,000 seat covers for its bicycles from an outside supplier. The operating cost is Rs. 10 per order and the carrying cost is Rs. 6 per unit per year. The company has 300 working days per year. Find the - [10]

(i) EOQ

(ii) The number of orders per year

(iii) Total inventory cost

(iv) No of inventory cycles in a year, and

(v) The duration of an inventory cycle.
