

# A Constituent Institute of Manipal University, Manipal

## VII SEMESTER B.TECH (MECHANICAL ENGG.) END SEMESTER EXAMINATIONS, NOVEMBER 2017

## SUBJECT: PRODUCTION PLANNING & CONTROL [MME 4103]

### **REVISED CREDIT SYSTEM**

Time: 3 Hours

MAX. MARKS: 50

#### Instructions to Candidates:

- Answer ALL the questions.
- Missing data if any may be suitably assumed
- **1A.** i) Quoting suitable examples explain the characteristics of a continuous or mass production activity and a job order production activity.

ii) Explain the strategies and variables of aggregate planning.

**1B.** ABC company produces fencing barbed wire at their works in Mumbai. The planning is for a time horizon of 4 quarters. The demand is as follows.

Quarter	1	2	3	4
Demand(Tons)	500	600	500	400

The company has a regular workforce which can produce 350 tons of output per quarter. The company has a policy of allowing overtime to the workers in every quarter to the extent of 20% of the regular time. The output rate during overtime is 25% higher than that of regular time but the O.T. expenses are 30% more than that of regular time. If required the company also subcontracts the requirement from another unit, but only at a 50% premium as compared to regular cost which is Rs. 50,000 per ton. No shortages are allowed and inventory carrying cost is Rs. 5000 per ton per quarter. The ending inventory required is 50 tons. Develop the cost effective aggregate plan considering a starting inventory of 100tons using trial and error method.

- 2A. Explain in detail the various measures of forecast error
- **2B.** A company manufacturing washing machines establishes a fact that there is a relationship between sale of washing machines and population of the city. The market research carried out reveals the following information.

Year	2012	2013	2014	2015	2016	2017
Population (million)	5	7	15	22	27	36
No. of washing machines sold. ('000)	28	40	65	80	96	130

Fit a linear regression equation and estimate the demand for washing machines for 2018 if the likely population in 2018 is 45 million.

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**3A.** The processing time in days and the due dates for the six jobs that are to be processed on a particular machine are as shown below:

Job	1	2	3	4	5	6
Processing Time (days)	10	8	4	14	6	10
Due date (days hence)	24	20	18	40	36	28

Schedule the jobs using SPT rule, determine the optimum sequence and calculate mean flow time, average job lateness & average number of jobs in the system.

- **3B.** Annual demand for an item is 36,000 units. The production capacity is 10,500 units per month. Production cost per unit is Rs.12.6. Inventory carrying cost rate is estimated to be 20%. The set up cost for each production run is Rs.225. Determine the quantity of inventory consumed during the buildup period and the total inventory carrying cost per year.
- **4A.** The demand for an item is 50000 units per year. The ordering cost is Rs.400 per order. The inventory carrying cost is Rs.4per unit per year. The purchase price depends on the order quantity and is shown in the table below:

Range of order quantity (units)	Up to 2999	3000-5999	6000 & above
Price (Rs./unit)	20	19.9	19.8

Determine the optimum ordering policy.

- **4B.** Each unit of end product P requires 2 units of sub component R. The lead time for P is one week and the standard order quantity is 120 units. The current availability for P is 105 units. Gross requirements for the next 6 weeks are 75, 90, 60, 45, 75 and 270 units respectively. For item R lead time is two weeks, standard order quantity is 240 units, safety stock is 180 units and current availability is 270 units. A scheduled receipt of 240 units of R is due in week 1. Develop the MRP schedule for P & R showing the safety stock as part of on hand/available inventory and considering the replacement demand of 120 and 540 units for component R in the 3<sup>rd</sup> and 6<sup>th</sup> week respectively.
- **5A.** Sterling Ltd. wants to set up an assembly line to produce 60 units per hour. The work elements and their precedence relationships are shown in the following table.

Work element	Time (secs)	Immediate Predecessor (s)		
(task)				
А	40	-		
В	30	A		
С	50	A		
D	40	В		
E	6	В		
F	25	С		
G	15	С		
Н	20	D,E		
1	18	F,G		
	30	НТ		

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Draw the network, calculate cycle time and theoretical minimum number of stations and balance the assembly line using the longest work element time rule and calculate the line efficiency and balance delay percentages?

**5B.** A fertilizer manufacturer is planning to set up a central warehouse to cater to eight customer regions. The coordinates of these regions and the quantity to be shipped are as shown below:

Customer Region	Tons shipped	XY-coordinates (miles)
Ă	5,000	(7, 13)
В	92,000	(8, 12)
С	70,000	(11, 10)
D	35,000	(11, 7)
E	9,000	(12, 4)
F	2,27,000	(13, 11)
G	16,000	(14, 10)
H	1,53,000	(15, 5)

Determine the centre of gravity as a possible location (round to the first decimal) for the warehouse and calculate the load distance score using rectilinear distance.