BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI
Second Semester (2016- 17) Comprehensive Examination (Regular)

Title**: Manufacturing Planning & Control**   Date**: 05/05/2017**
Course No**: MSE G512**   **(11 questions)**   MM**: 40 (Open Book)**

1. Answer the following questions briefly and sequentially (**1 mark** each):
    (a) What are competitive dimensions? List and explain any six dimensions with examples of firms
    (b) Which one is better, MAD or MAPE? Why?
    (c) How can we reduce the process flow time?
    (d) What is the difference between process flowchart and service blueprint?
    (e) Is capacity focus and capacity flexibility same? Justify
    (f) What are the assumptions of NPV?
    (g) What are the strategies for matching capacity to demand?
    (h) What is the difference between a Gantt load chart and a Gantt scheduling chart?
    (i) How does aggregate planning in services differ from aggregate planning in manufacturing?
    (j) Define shrinkage. List three examples of shrinkage
    (k) Are fixed-quantity and fixed-period inventory systems same? Justify? When these will be useful?
    (l) Differentiate among various models useful in location decisions.

2. Gupta is operating a bakery in Pilani which produces special cakes, whose demand has increased by 30% in the last year. To tackle this an employee suggested a change so that more cakes can be baked at one time. This new process will require additional manpower. If the bakery makes 2000 cakes per month with a labor productivity of 3.246 cakes per labour-hour and each worker works for 160 hours per month, how many workers will Gupta need to add for this change. The pay is ₹12 per hour per employee. Gupta can also improve the yield by installing a new blender. The new blender will mean an increase in his investment. This added investment has a cost of ₹125 per month, but he will achieve the same output as the change in labour-hours.   [**3**]

    (a) What is the new productivity, in cakes per ₹, with an increase in labour cost

    (b) What is the new productivity, in cakes per ₹, with only an increase in investment

    (c) Which is the best decision?

3. Mumbai is playing Delhi in the last game of IPL. Mumbai needs 7 runs to win from 2 balls. At this time, they scored four runs. Now they need 3 runs from 1 ball to win. Mumbai can either score three runs and win or score two runs to send the game into super over. The position of Mumbai's team will be determined by the outcome of this game. If Mumbai wins they will go to the Semifinals, with a payoff of ₹7600000; if they lose they will go to the super six, with a payoff of ₹2400000. If Mumbai try for three runs, there is a 35% chance they will be successful and win (and a 65% chance they will fail and lose). If they go for two runs, there is a 0.95 probability of success and a tie and a 0.05 probability of failure. If they tie they will play super over, in which Mumbai believes they have only a 20% chance of winning because of hitters in Delhi team.   [**3**]

    a) Use decision-tree analysis to determine if Mumbai should go for two runs or three runs.

    b) What would Mumbai's probability of winning the game in super over have to be to make Mumbai indifferent between going for two runs or three runs?

4. Motorola wants to establish an assembly line for assembling a new phone. The tasks, task times and immediate predecessors are as follows: (demand is 40 phones per day; working time is 8hrs per day)   [**3**]

Task	Time (seconds)	Predecessors	Task	Time (seconds)	Predecessors
A	600	None	D	360	B, C
B	720	A	E	360	C
C	480	A, B	F	360	D, E

    a) Draw the schematic diagram

    b) Balance the line in minimum number of workstations possible. Write all the possibilities

    c) Calculate the efficiency of the assembly line you designed

5. Nobles bakery special cookie has a daily demand of 250 units, which has a special setup cost of ₹175 per production run, a monthly holding cost per unit of ₹3, and an annual production rate of 2,36,250 units. The bakery operates and experiences demand 315 days per year. Suppose that owner mistakenly used the EOQ model to calculate the batch size instead of using the POQ model. What is the effect of this mistake in a year?   [**3**]

6. Bata Shoe Company has two assembling plants, one at Manesar and other at Goa with the respective capacities of 435 and 225. The top management wants to build a new plant and identified two new locations, Ranchi and Raipur with respective capacities 340 and 350 each. The company has warehouses at Pondicherry, Surat and Haridwar with respective demands of 350, 200, 450. The costs associated with transferring products between these plants and warehouses are as follows: to Pondicehrry, Surat, and Haridwar from Manesar (100, 75, 50), from Goa (80, 60, 90), from Ranchi (60, 50, 90) and from Raipur (90, 70, 30). Using transportation method, help the top management finalize the new plant location. What will be the optimum total cost after that? [2 + 1]

7. VFAST Guest House (VGH) normally charges the same price ₹500 per day for all rooms and for all guests. While the VGH is pretty near capacity in the winter and monsoon season, it finds that its rooms are only about 60 percent occupied during the summer. One of your classmate of MPC course wonders if yield management might be useful to both the VGH and its guests alike. This student, with help from some of you, estimates a demand curve for summer room allotment. Points on this demand curve include 9000 room days at the current rate of ₹500, 12,000 room days at ₹400, 15,000 room days at ₹350, and 18,000 room days at ₹300. Based on this demand curve, what price point would best serve the VGH, if its objective is the greatest revenue for the summer? [2]

8. Rajesh, owner of Vishwakarma Furniture has received the following estimates of demand

Month	Demand	Month	Demand
January	1100	April	1600
February	1200	May	1800
March	1200	June	1500

Assuming stockout costs of lost sales will be ₹100 per unit, inventory carrying costs of ₹25 per unit per month, and zero beginning and zero ending inventory, evaluate the following plans: [3]

a) Vary the workforce, which performs at a current production level of 1200 units per month. The cost of hiring additional workers is ₹2500 per 100 units produced. The cost of layoffs is ₹5500 per 100 units cut back.

b) Keep the current workforce at a level capable of producing 1200 units per month. Permit a maximum of 22% overtime at a premium of ₹42 per unit. Assume that warehouse limitations permit no more than a 185 units carryover from month to month. This plan means that any time inventory reach 185, the plant is kept idle. Idle time cost per unit is ₹63. Any additional needs are subcontracted at a cost of ₹62 per unit.

c) Keep the workforce, at a level capable of producing average over the time period.

9. The workshop of BITS Pilani manufactures and supplies chairs, desks, and other furniture to hostels. The workshop operates to minimize its costs of operations. In the workshop, there are two types of standard chairs, wooden chairs and metal chairs. Wooden chair is considerably heavier than metal chair, and costs ₹5 per chair to transport to any hostel; each metal chair costs ₹3 to transport. The workshop has 600 chairs: 300 each of wooden and metal. The requirements for shipments to each of the hostels are as follows: Bhagirath Bhawan needs at least 150 wooden chairs. Shankar Bhawan needs at least 225 metal chairs. Krishna Bhawan needs at least 150 chairs, but they can be of either type, mixed. Gandhi Bhawan needs 60 chairs, but at least as many metal as wooden. Write out the objective function and the constraints for this problem [2]

10. The following six jobs need to be processed in both the machines. Identify the total time by sequencing in this order. Determine the sequence which will minimise the total time. Chart the both sequences. [3]

Job	Grinder (min)	Separator (min)	Job	Grinder (min)	Separator (min)
A	10	5	D	3	8
B	7	4	E	2	6
C	5	7	F	4	3

11. Gopal, an inventory planner needs to schedule an order for 550 bikes, which are to be shipped in week 9. The following table shows the items, lead time, on-hand inventory and the required components (number) for each parent. Assume lot-for-lot ordering, if not specified. [3]

Item	Lead time (weeks)	Lot size	On-Hand Inventory	Components
Bike	2		20	A(1), B(3), C(2)
A	1	<400	10	D(1), F(2)
B	2	Multiples of 1000	30	E(1), F(3)
C	3	>1200	10	D(2), E(3)
D	1		15	
E	3		25	
F	2		20	

(a) Develop a product structure
(b) Develop a time-phased structure
(c) Develop a net material requirements plan for items 'D', 'E' and 'F'