BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI
II Semester 2022 – 2023

Course No: MSE G512 **Course Title:** Manufacturing Planning & Control
Date: 17th May 2023 **Max Time:** 180 min
Max Marks: 70 **Comprehensive Examination (Open Book)**

Part A [5]

Q. 1. What are the consequences of outsourcing production? The benefits? Is there a point at which too much outsourcing is dangerous? How do you view outsourcing as a consumer? As an employee?
Q. 2. Briefly describe how operations can be viewed as a transformation process.
Q. 3. What constitutes operations for your university, an organization of which you are a member, or your place of business?
Q. 4. Make a list of the basic steps involved in using the quantity discount model and discuss each.
Q. 5. What are the differences between independent and dependent demand?
Q. 6. Why is monitoring an important component of job shop scheduling?

Part B [8]

Q. 1. Mahindra Industries maintains production facilities in several locations around the globe. Average monthly cost data and output levels are as follows. a. Calculate the labor productivity of each facility. b. Calculate the multifactor productivity of each facility. c. If Omar needed to close one of the plants, which one would you choose?

Units (in 000s)	Cincinnati	Frankfurt	Guadalajara	Beijing
Finished goods	10,000	12,000	5,000	8,000
Work-in-process	1,000	2,200	3,000	6,000
Costs (in 000s)	Cincinnati	Frankfurt	Guadalajara	Beijing
Labor costs	$3,500	$4,200	$2,500	$800
Material costs	$3,500	$3,000	$2,000	$2,500
Energy costs	$1,000	$1,500	$1,200	$800
Transportation costs	$250	$2,500	$2,000	$5,000
Overhead costs	$1,200	$3,000	$2,500	$500

Q. 2. The GNO Company is a catalogue sales operation that specializes in outdoor recreational clothing. Demand for its items is very seasonal, peaking during the holiday season and during the spring. It has accumulated the following data for order per "season" (quarter) during the past five years:

Orders (1000s)					
Quarter	2006	2007	2008	2009	2010
January–March	18.6	18.1	22.4	23.2	24.5
April–June	23.5	24.7	28.8	27.6	31.0
July–September	20.4	19.5	21.0	24.4	23.7
October–December	41.9	46 3	45.5	47.1	52.8

a. Develop a seasonally adjusted forecast model for these order data. Forecast demand for each quarter for 2011 (using a linear trend line forecast estimate for orders in 2011). b. Develop a separate linear trend line forecast for each of the four seasons and forecast each season for 2011. c. Which of the two approaches used in parts (a) and (b) appear to be the most accurate? Use MAD to verify your selection.

Q. 3. The DVF produces a natural organic fertilizer, which it sells mostly to gardeners and homeowners. The annual demand for fertilizer is 420,000 pounds. The farm is able to produce 505,000 pounds annually. The cost to transport the fertilizer from the plant to the farm is $620 per load. The annual carrying cost is $0.12 per pound.

a. Compute the optimal order size, the maximum inventory level, and the total minimum cost.

b. If the farm can increase production capacity to 560,000 pounds per year, will it reduce total inventory cost?

Q. 4. Sitting on Maggie Brumfield's desk is the latest planned order report from the company's MRP system. Maggie's job is to determine if there is enough capacity to handle the workload and to level the load if it's uneven. She gathers the latest cost figures and gets to work. Subcontracting and hiring extra workers are not options at this point, but overtime, pulling work ahead, and postponing work are. Regular production costs $10 an hour and is limited to 40 hours a week. Overtime costs $15 an hour and cannot exceed 40 extra hours (i.e., a double shift). An inventory cost of $3 per period is assessed for each hour's worth of work performed in advance. Postponing work costs $20 per item per period. Use the following information to construct an initial load summary chart. Level the loads. Then create a revised chart that meets demand at the least possible cost. How much money is saved by economically leveling the load?

PLANNED ORDER REPORT

	Week			
Item	1	2	3	4
A	100			
B	110		260	
C		610		170
D	10			

PROCESSING TIMES

	Setup Time Item (min)	Run Time(min per unit)
A	15	3
B	30	15
C	50	10
D	45	4

Q. 5. Casey Belzer runs a small machine shop that fabricates parts for sprayers used in foam insulation equipment. With the renewed interest in green building practices and high energy costs, demand for his products have increased dramatically. The shop has three CNC machines that can serve a variety of purposes. As customer orders come in, a routing sheet is developed and the order is diagrammed as shown below. When demand was low, it didn't really matter how the jobs were scheduled. Now, Casey wants to finish each job as quickly as possible so he can move on to the next one. Help Casey develop a schedule that would finish a customer order for 300 units of part A as soon as possible. Assume one B, C, and D are needed for each A. a. Find the bottleneck process. b. According to the theory of constraints, which component (i.e., B, C, or D) should be schedule first on the bottleneck process? c. Which component should be scheduled last? d. Map out the optimum schedule on a Gantt chart and calculate the completion time. Assume that the process batch size is 200 and the transfer batch size is one.

WX(y)Z
W = Item
X= Operation
(y) = machining center
Z = minutes to process

A		
B	C	D
B3(1)3	C3(1)8	D3(1)5
B2(1)5	C2(1)2	D2(1)8
B1(1)7	C1(1)4	D1(1)5

**********good luck**********