Birla Institute of Technology and Science, Pilani
MBA G519 Production and Operations Management
Comprehensive Examination (2016-2017) II Semester - (Close Book)

Marks: 80 **Time: 3 Hrs.**
Weight: 40%

Note: Use of Scientific calculator is permitted.

1. Fred's Fabrication has the following aggregate demand requirements and other data for the upcoming four quarters.

Quarter	Demand
1	700
2	900
3	1200
4	600

Previous quarter's output	800 units
Beginning inventory	0 units
Stockout cost	$100 per unit
Inventory holding cost	$10 per unit at end of quarter
Hiring workers	$20 per unit
Firing workers	$40 per unit
Subcontracting cost	$200 per unit
Unit cost	$100 per unit
Overtime	$50 extra per unit

Which of the following production plans is better: Plan A—chase demand by hiring and firing; Plan B—pure level strategy (Assume average quarterly level production)? (5+5=10 M)

2. The operations manager of a body and paint shop has five cars to schedule for repair. He would like to minimize the throughput time (makespan) to complete all work on these cars. Each car requires body work prior to painting. The estimates of the times required to do the body and paint work on each are as follows:

Car	Body Work (Hours)	Paint (Hours)
A	8	7
B	9	4
C	7	9
D	3	4
E	12	5

a. Use Johnson's rule to sequence these five jobs for minimum total duration. Show your stepwise work in determining the job sequence. (4 M)
b. Chart the progress of the five jobs in this optimal sequence. (4 M)
c. After how many hours will all jobs be completed? (2 M)

3. Wiley's Food Market owns grocery stores in four communities in a three-county area. They want to construct a centrally-located warehouse to process, package, and distribute produce and other food items for their four stores. The items are transported in 40-foot trailer trucks. The stores have the following set of coordinates and annual shipments.

A	B	C	D
$x_A = 60$	$x_B = 110$	$x_C = 35$	$x_D = 70$
$y_A = 130$	$x_B = 40$	$x_C = 90$	$x_D = 50$
$w_A = 145$	$w_B = 210$	$w_C = 160$	$w_D = 95$

Three sites are being considered for the warehouse with the following coordinates:

Site 1: $x_1 = 50$, $y_1 = 60$
Site 2: $x_2 = 100$, $y_2 = 70$
Site 3: $x_3 = 40$, $y_3 = 90$

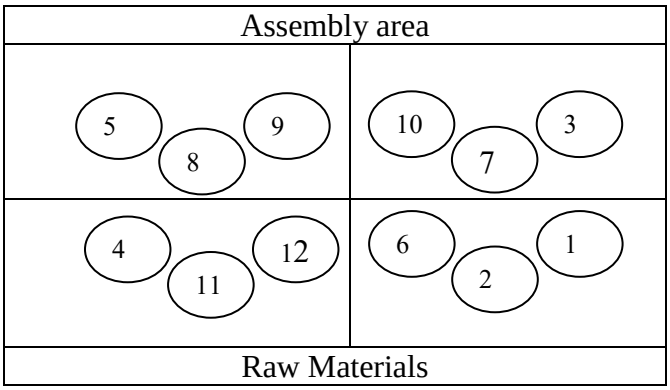
Using the load-distance technique, determine the best location for the warehouse. (3+3+3= 9 M)

4. Jetaway, a small manufacturer of replacement parts for the aircraft industry, had always maintained a simple layout- all like machines were located together. That way the firm could be as flexible as possible in producing small amounts of the variety of parts its customers required. No one questioned the production arrangement until Krish started to work for the company. Krish was actually hired to upgrade Jetaway's computer system. In the process of creating a database for part routings, Krish began to see similarities in the parts produced. A part routing matrix for nine of the most popular parts is shown below, along with a schematic of the factory layout.
Krish, who was already tired of being programmer, decided to reorder the matrix and see what he could find. If he could identify distinct part families, he could reorganize the placement of machines into the cells he had been reading about in his business magazines. May be then someone would notice his management potential.
Help Krish gain status in Jetaway by creating an improved layout for the company. Show your results in a schematic diagram. Be sure to include the reordered routing matrix. (5+5=10 M)

Part Routing Matrix

	Machines											
Parts	1	2	3	4	5	6	7	8	9	10	11	12
A	x			x	x							
B		x	x			x						
C								x			x	
D	x			x	x		x					
E		x	x			x			x			x
F								x		x	x	
G	x				x		x					
H		x	x			x			x			
I								x		x		

Initial Layout



5. The demand for subassembly S is 100 units in week 7. Each unit of S requires 1 unit of T and 2 units of U. Each unit of T requires 1 unit of V, 2 units of W, and 1 unit of X. Finally, each unit of U requires 2 units of Y and 3 units of Z. One firm manufactures all items. It takes 2 weeks to make S, 1 week to make T, 2 weeks to make U, 2 weeks to make V, 3 weeks to make W, 1 week to make X, 2 weeks to make Y and 1 week to make Z. (4+7=11 M)

(a) Construct a product structure tree. Identify all levels parents and components.
(b) Using given information, construct a gross material requirement plan.

6. A toy manufacturer makes its own wind-up motors, which are then put into its toys. While the toy manufacturing process is continuous, the motors are intermittent flow. Data on the manufacture of the motors appears below.

Annual demand (D) = 50,000 units Daily subassembly production rate = 1,000
Setup cost (S) = $85 per batch Daily subassembly usage rate = 200
Carrying cost = $.20 per unit per year

a. To minimize cost, how large should each batch of subassemblies be?
b. Approximately how many days are required to produce a batch?
c. How long is a complete cycle?
d. What is the average inventory for this problem?
e. What is the total inventory cost (rounded to nearest dollar) of the optimal behavior in this problem? (2x5=10M)

7. A bank's manager has videotaped 20 different teller transactions to observe the number of mistakes being made. Ten transactions had no mistakes, five had one mistake and five had two mistakes. Identify which type of control chart should be used? Compute proper control limits at the 90% confidence level. (Take Z value = 1.65) (2+3+3=8M)

8. Jim's department at a local department store has tracked the sales of a product over the last ten weeks. Forecast demand using exponential smoothing with an alpha of 0.4, and an initial forecast of 28.0. Calculate MAD and the tracking signal. What do you recommend? (5+5+2=12M)

Period	Demand
1	24
2	23
3	26
4	36
5	26
6	30
7	32
8	26
9	25
10	28