INDU 421: Facilities Design and Material Handling Systems

Assignment 2

1- A part requires three processing steps on two machines in the sequence A-B-A. The demand this part is 10,000 units per year. The company operates six days per week, eight hours per day. Given the following performance data, find the number of each machine needed to meet the demand.

Operation	Machine	Standard time	Efficiency	Reliability	Defects
1	A	5 min	108%	98%	3%
2	B	3min	95%	95%	5%
3	A	3 min	90%	95%	5%

2- Given the following, what are the machine fractions for machines A, B and C to produce part x and y?

	Machine **A**	Machine **B**	Machine **C**
Part x standard time	0.15 hr	0.25 hr	0.1 hr
Part y standard time	0.1 hr	0.1 hr	0.15 hr
Part x scrap estimate	5%	4%	3%
Part y scrap estimate	5%	4%	3%
Historical efficiency	90%	90%	95%
Reliability factor	90%	90%	95%
Equipment availability	1600 hr/year	1600 hr/year	1600 hr/year

Part X routing is machine A, then B and then C; 110,000 parts are to be produced per year. Part Y routing is machine B, then A and then C; 250,000 parts are to be produced per year. Setup time is 20 min and 40 min, respectively

3- Suppose 5 identical machines are to be used to produce two different products. The operation parameters for the two products are as follow: $a_1 = 2\ min;\ a_2 = 2.5\ min;\ b_1 = 1\ min;\ b_2 = 1.5\ min;\ t_1 = 6\ min;\ t_2 = 8\ min.$ The cost parameters are the same for each operator-machine combinations: $C_0 = \$15 hr\ and\ C_m = \$50$. Determine the method of assigning operators to machines that maximizes the cost per unit produced.

4- It takes 3 minutes to load and 2 minutes to unload a machine. Inspection, Packing and travel between the machines total 1 minute. Machine run automatically for 20 minutes. Operator cost $12 per hour; machines cost $30 per hour.

a. What is the maximum number of machines that can be assigned an operator without creating machine idle time during a repeating cycle?
b. What assignment minimizes the cost per unit produced?
c. If 4 machines are assigned an operator what will be the cost per unit produced?
d. For what range of values for concurrent activity is the optimum assignment equal to 4?