NORTHEASTERN UNIVERSITY

Department of Mechanical and Industrial Engineering

Supply Chain Engineering **Prof. Gupta**

IE 7200 **Spring 2014 (Mondays)**

Homework No. 8

(Due: April 7, 2014)

Problem 1. Construct a project network with the following precedence relationships:

Activity	Immediate Successor	Duration
A	B, C	10
B	D	7
C	D, E	12
D	F	5
E	F	4
F	-	6

(a) Find the critical path of this project.

(b) If the duration of activity D is reduced to 2 days, what is the effect on the critical path?

Problem 2. Construct a project network with the following precedence relationships:

Activity	Immediate Successor	Duration		
		Optimistic	Most Likely	Pessimistic
A	E, F	8	10	14
B	C, D, E, F	0.5	1	2
C	H	16	20	25
D	G, H	3	5	8
E	G, H	7	10	12
F	-	0.5	2	4
G	-	8	12	17
H	-	0.75	1	1.5

(a) Check the consistency of your network.

(b) Find the critical path and project duration of this project.

(c) Determine the probability of completing the project 3 days earlier.

(d) Determine the sequence of activities that constitute the second and third critical paths, that is, the paths of the second and third longest duration.

(e) Based on the first, second and third critical paths determine the four most critical activities. Explain your reasons for choosing these four activities.

(f) Find a time, say x, such that the probability of project completion time exceeding x is less than approximately 0.10.

(g) If the total available resources for this network are 3 units and the resources required for activities A through H are as follows:

Activity	Resources Required
A	2
B	1
C	2
D	1
E	1
F	2
G	1
H	1

i. Find the duration to complete all activities using the ACTIM approach.

ii. Find the duration to complete all activities using ACTRES approach.

Problem 3.

(a) The following jobs are to be processed on a drill. Determine the sequence that minimizes the mean flow time.

Job	1	2	3	4	5	6	7
Processing Time	10	5	8	7	5	4	8

(b) Use the Longest Processing Time rule for sequencing jobs. Compare the mean flow times of parts (a) and (b).

Problem 4. A set of 10 jobs are to be processed on two machines, MA and MB. Each job must be processed on MA first, followed by MB. The processing times are as follows:

Job	1	2	3	4	5	6	7	8	9	10
MA	8	7	9	7	2	5	5	2	7	1
MB	6	5	2	8	4	1	7	3	3	5

Determine the optimal makespan schedule. What is the optimal makespan?

Problem 5. The following processing times were obtained for an N-job, three-machine problem. Find the minimum makespan schedule.

Job	**Machine 1**	**Machine 2**	**Machine 3**
1	10	8	7
2	12	5	9
3	15	7	12
4	9	1	10
5	11	3	9
6	13	6	5

Determine the optimal makespan schedule. What is the optimal makespan?