HARCOURT BUTLER TECHNICAL UNIVERSITY, KANPUR

ASSSIGNMENT - 3/OPERATIONS RESEARCH / Scheduling Techniques (CPM/PERT) /BMA-341/342

III -B.Tech. - ME/CS 2021-22

1. Find the sequence that minimizes the total elapsed time (in hours) required to complete the following jobs on three machines M_1, M_2, M_3 in the order M_1---> M_2---> M_3 :

Jobs---> Machines ↓	A	B	C	D	E
M_1	6	8	7	10	6
M_2	3	2	5	6	4
M_3	4	8	6	7	8

Find the minimum elapsed time and the idle time for each machine.

2. Assuming that the expected times are normally distributed; find the probability of meeting the scheduled time as given for the network.

Activity (i-j)	Days		
	Optimistic Time t_o	Most likely Time t_m	Pessimistic Time t_p
1-2	2	5	14
1-3	9	12	15
2-4	5	14	17
3-4	2	5	12
4-5	6	6	12
3-5	8	17	20

Scheduled project completion time is 30 days. Also find the date on which the project manager can complete the project with a probability of 0.90.

3. What do you understand by sequencing problem? Describe the assumptions underlying the sequencing problems. We have nine jobs, each of which must be processed on two machines I and II in order I-II. The processing times (in hrs) for the jobs are given below:

Job	A	B	C	D	E	F	G	H	I
Machine I	4	7	6	11	8	10	9	7	6
Machine II	8	10	9	6	5	11	5	10	13

Determine the sequence for the jobs that will minimize the total elapsed time.

4. Consider the following project.

Activity	Time estimates in weeks			Predecessor
	Optimistic Time t_o	Most likely Time t_m	Pessimistic Time t_p	
A	3	6	9	None
B	2	5	8	None
C	2	4	6	A
D	2	3	10	B
E	1	3	11	B
F	4	6	8	C,D
G	1	5	15	E

Find the critical path and standard deviation for each activity.Also find the probability of completing the project by 18 weeks.

5. What is CPM? What are the essential steps in CPM for project planning?

6. What are the objectives of CPM and PERT? Describe the rules for network construction and differentiate between CPM and PERT.

A project has the following characteristics:

Activity	Optimistic time (days) t_0	Most likely time t_m	Pessimistic time t_p
1-2	2	5	14
1-6	2	5	8
2-3	5	11	29
2-4	1	4	7
3-5	5	11	17
4-5	2	5	14
6-7	3	9	27
5-8	2	2	8
7-8	7	13	31

(i) Draw the network diagram,
(ii) Find the expected time and variance of each activity.
(iii) .Calculate EST and LFT and mark them on the network diagram.
(iv) Find the critical path and total project duration

7. Construct the network for the following activity data:

Activity:	A	B	C	D	E	F	G	H	I	J	K	L
Predecessor:	-	A	A	B	C	C	E	F	G,H	G,H	I	J

8. For the following activity data draw the network, find the critical path, total project duration and the three floats for each activity:

Activity:	1-2	1-4	2-3	3-5	3-8	4-8	5-6	5-8	6-7	7-8	7-9	8-9	9-10
Duration: (days)	4	36	2	15	10	2	4	9	9	9	8	20	20

9. For the network shown below:

Activity	t_o	t_m	t_p
1-2	2	5	8
2-3	1	1	1
3-5	0	6	18
5-6	7	7	7
1-4	3	3	3
4-5	2	8	14

(a) Calculate the values of expected time (t_e), Standard deviation and variance for each activity.
(b) Draw the network diagram and mark t_e on each activity.
(c) Calculate EST and LFT and mark them on network diagram.
(d) Calculate total slack for each activity.
(e) Identify the critical path and mark on the network diagram.

10. A project schedule has the following characteristics:

Activity	Duration	Activity	Duration
1-2	3	4-8	6
1-4	2	5-6	5
1-7	1	6-9	4
2-3	3	7-8	4
3-6	2	8-9	5
4-5	4		

Construct a network and find critical path, total duration of the project and various time estimates.

11. Write short notes on:
(a) Events, Activity
(b) Critical path, Float
(c) EST, LST, EFT, LFT
(d) Differentiate CPM and PERT.