

National Institute of Technology Hamirpur
Dept of Civil Engineering
B. Tech Third Year
V Semester
End Semester Examination:2020-21
CE-306–CPM and PERT
(Open Elective)

Duration: 2 Hours

Max. Marks: - 50

Instructions:

- Answer all questions
- Missing data, if any, may be assumed suitably.
- Calculator is allowed.

1 A project consists of 10 jobs as detailed below. Write the steps and arrow diagram representation of the project. [5]

Jobs	Processor
A	None
B	None
C	None
D	A
E	B
F	B
G	C, F
H	D, G
I	E, H
J	C, F

2 The following information applies to a particular project. [10]

- Jobs A and F can be started and completed independently.
- Jobs B and C can start only after job A has been completed.
- Jobs D, E and G can start only after jobs B, (C and D) and (E and F) are completed, respectively.

Time estimates of all the jobs are given in the following table:

Job	Time Estimates (Days)		
	Optimistic	Pessimistic	Most Likely
A	3	7	5
B	7	11	9
C	4	24	14
D	4	12	8
E	6	12	6
F	5	19	12
G	2	6	4

- i. Draw the network and determine the critical path, and its expected duration (T_e).
- ii. What is the probability of completing the project in 30 days?

3 Compute the earliest and the latest event times as well as the following activity times for the network shown in the Fig. 1. [10]

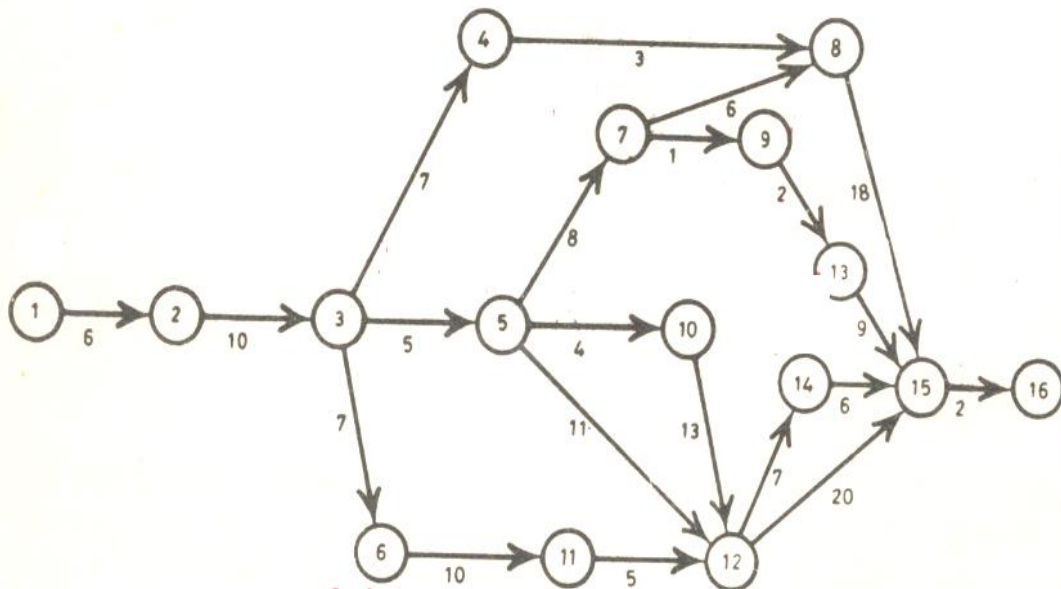


Fig. 1

- i. Earliest start time
- ii. Latest start time
- iii. Earliest finish time
- iv. Latest finish time

Also compute total float, free float, and independent float and determine the critical path.

4 The following information applies to a particular project: [15]

Event 0 is the initial event

Event 1 is preceded by event 0

Event 3 is preceded by event 1

Event 4 is preceded by event 1

Event 2 is preceded by event 1

Event 3 is preceded by events 2 and 1

Event 4 is preceded by events 3 and 1

Event 5 is preceded by event 4

The values of the expected times, crash times, normal costs and crash costs for the various activities in the project are as follows:

Activity	0-1	1-3	1-2	2-3	1-4	3-4	4-5
Expected time (days)	3	16	6	8	10	5	3
Crash time (days)	2	11	4	6	6	3	2
Normal cost (Rs.)	5000	10000	8000	12000	15000	9000	6000
Crash cost (Rs.)	5500	12000	9500	16000	19000	12000	7800

- i. Draw the arrow diagram for the project.
- ii. If the project overhead cost are Rs. 1700 per day, Find the optimum cost and optimum duration for the project. Also draw the least cost network.

5 Prepare manpower loading charts based on the late start times for the project network shown in Fig. 2. Compute the optimum crew size. [10]

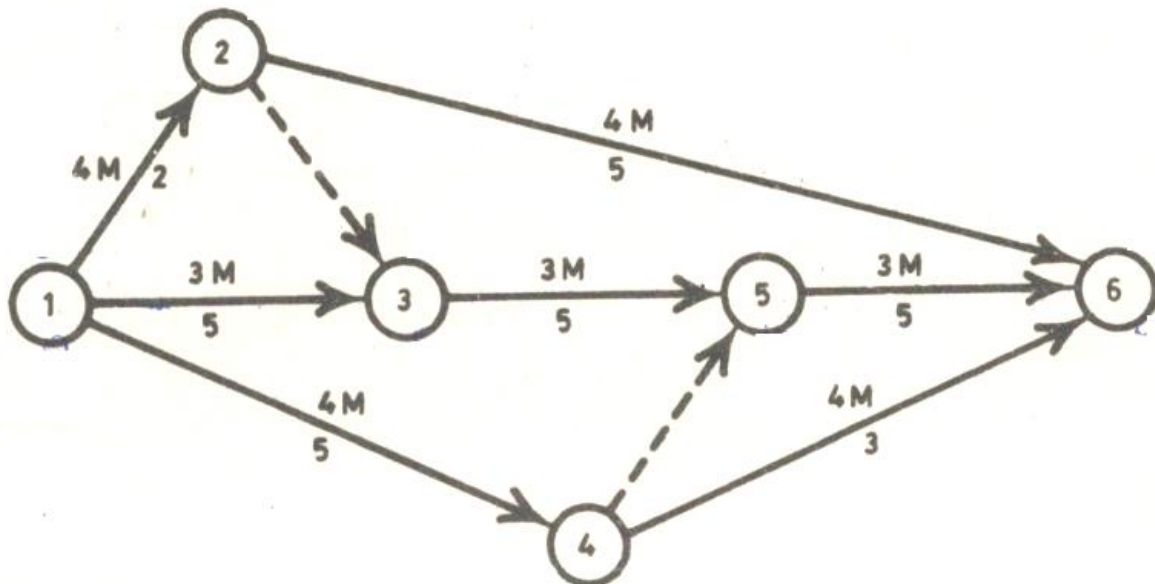


Fig. 2

Standard Normal Distribution Function

Z(+)	Probability (P _r) (%)	Z(-)	Probability (P _r) (%)
0	50.0	0	50.0
+ 0.1	53.98	- 0.1	46.02
+ 0.2	57.93	- 0.2	42.07
+ 0.3	61.79	- 0.3	38.21
+ 0.4	65.54	- 0.4	34.46
+ 0.5	69.15	- 0.5	30.85
+ 0.6	72.57	- 0.6	27.43
+ 0.7	75.80	- 0.7	24.20
+ 0.8	78.81	- 0.8	21.19
+ 0.9	81.59	- 0.9	18.41
+ 1.0	84.13	- 1.0	15.87
+ 1.1	86.43	- 1.1	13.57
+ 1.2	88.49	- 1.2	11.51
+ 1.3	90.32	- 1.3	9.68
+ 1.4	91.92	- 1.4	8.08
+ 1.5	93.32	- 1.5	6.68
+ 1.6	94.52	- 1.6	5.48
+ 1.7	95.54	- 1.7	4.46
+ 1.8	96.41	- 1.8	3.59
+ 1.9	97.13	- 1.9	2.87
+ 2.0	97.72	- 2.0	2.28
+ 2.1	98.21	- 2.1	1.79
+ 2.2	98.61	- 2.2	1.39
+ 2.3	98.93	- 2.3	1.07
+ 2.4	99.18	- 2.4	0.82
+ 2.5	99.38	- 2.5	0.62
+ 2.6	99.53	- 2.6	0.47
+ 2.7	99.65	- 2.7	0.35
+ 2.8	99.74	- 2.8	0.26
+ 2.9	99.81	- 2.9	0.19
+ 3.0	99.87	- 3.0	0.13