Activity On Network

Total Float

ES	Activity	EF
LS	Duration	LF

Free Float :

ES = Earliest Start , EF = Earliest Finish
LS = Latest start , LF = Latest Finish.

Activity Span = LF − ES ; EFD = ES + Duration ; Max EF = LF

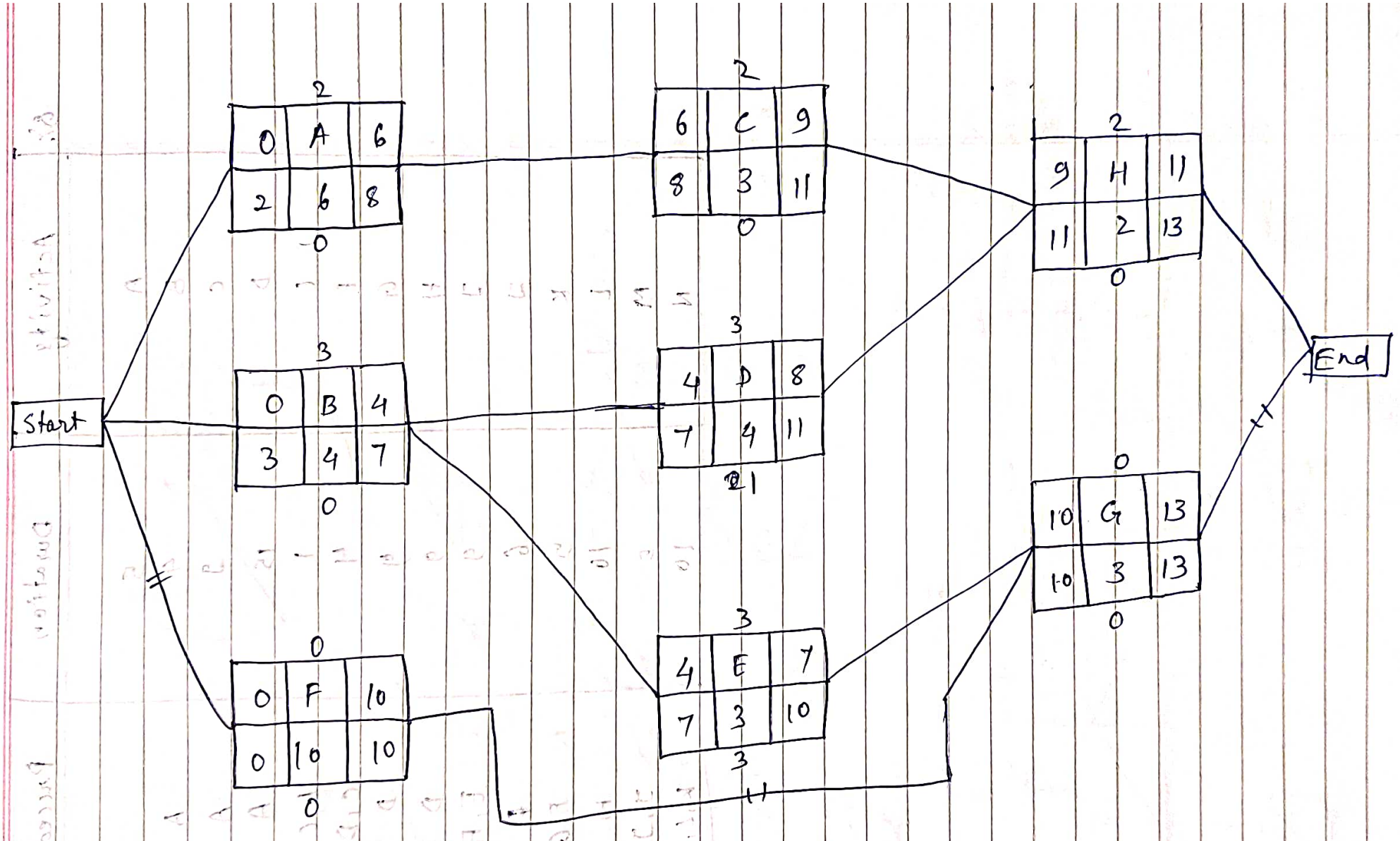
Total Float, TF = LF − EF ; LS = LF − Duration

Free Float, FF = EF of current Activity − ES of succeeding Activity

Interfaring Float = TF − FF

Q)

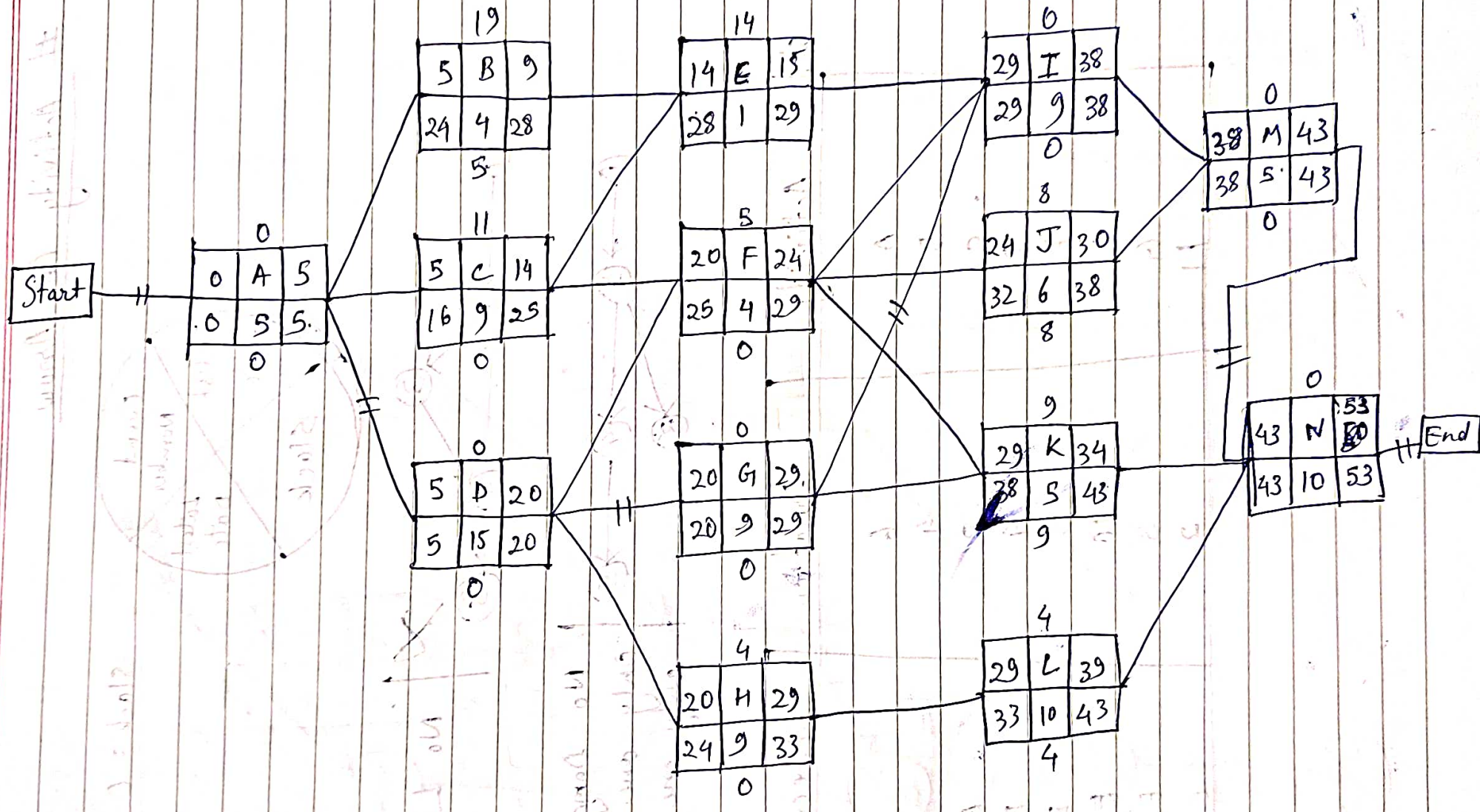
Activity	Duration	Precedents
A	6	
B	4	
C	3	A
D	4	B
E	3	B
F	10	
G	3	E, F
H	2	C, D



Critical Path = F → G

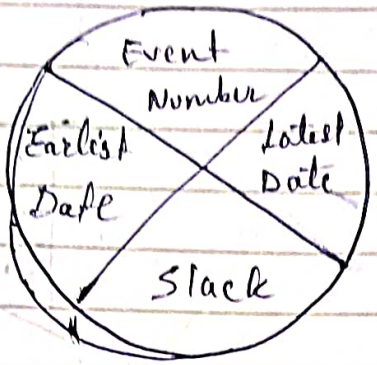
8).

Activity	Duration	Precedents
A	5	
B	4	A
C	9	A
D	15	A
E	1	B, C
F	4	C, D
G	9	D
H	9	D
I	9	E, F, G
J	6	F
K	5	F, G
L	10	H
M	5	I, J
N	10	K, L, M

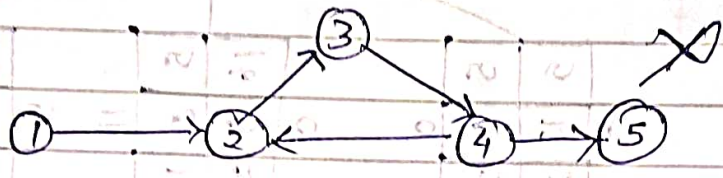


CRITICAL PATH = A → D → G → I → M → N

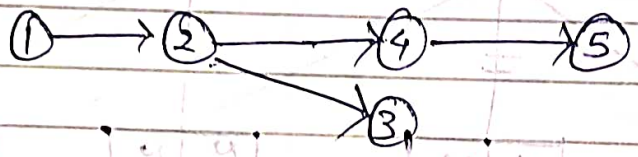
Activity On Arrow



Slack = 0 = Critial path



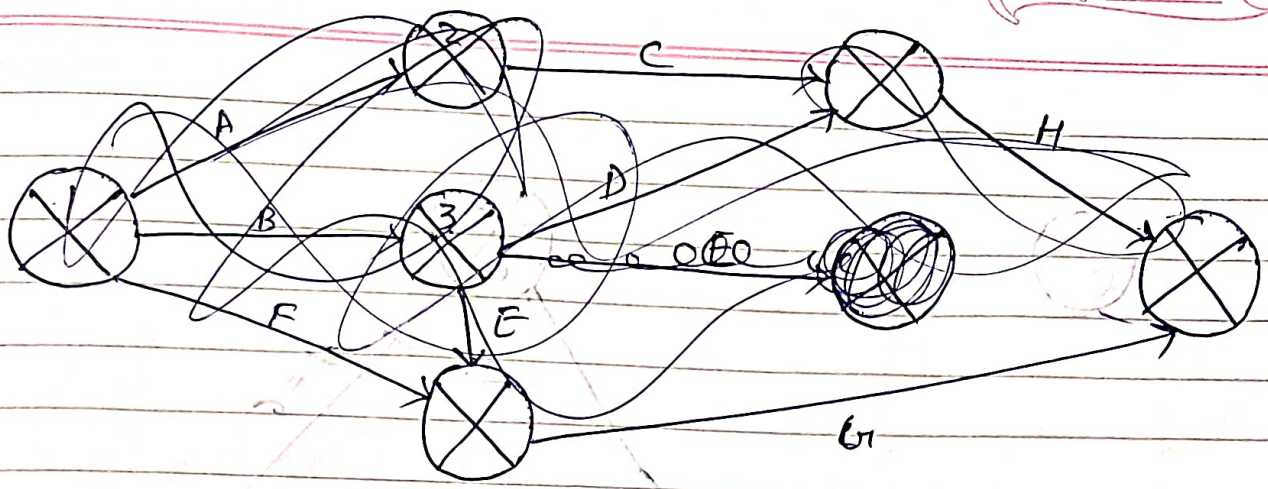
No Loops

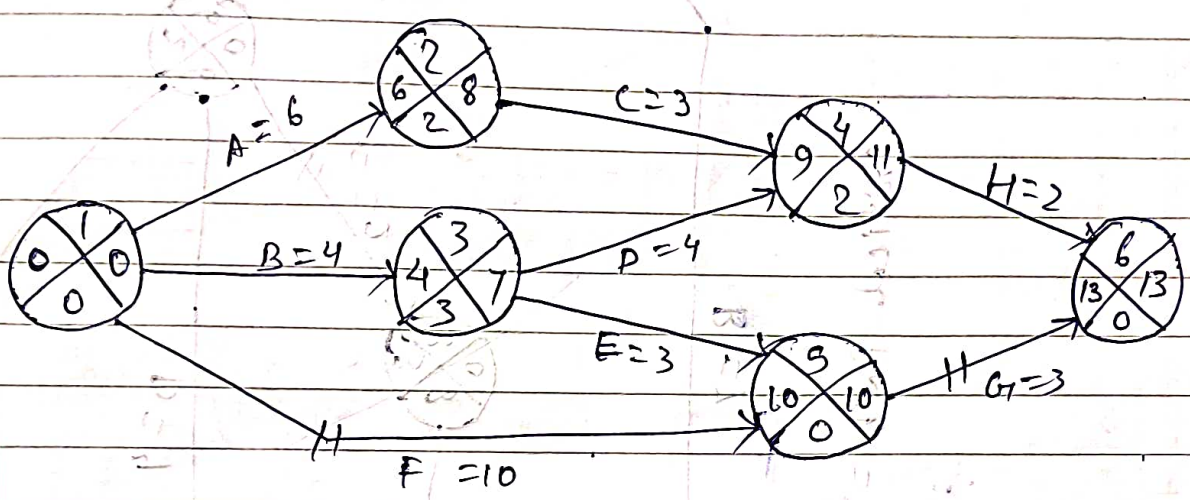


No Dangle
Only one start & only one end.

Q)

Activity	Duration	Precedents
A	6	
B	4	
C	3	A
D	4	B
E	3	B
F	10	E
G	3	E, F
H	2	C, D

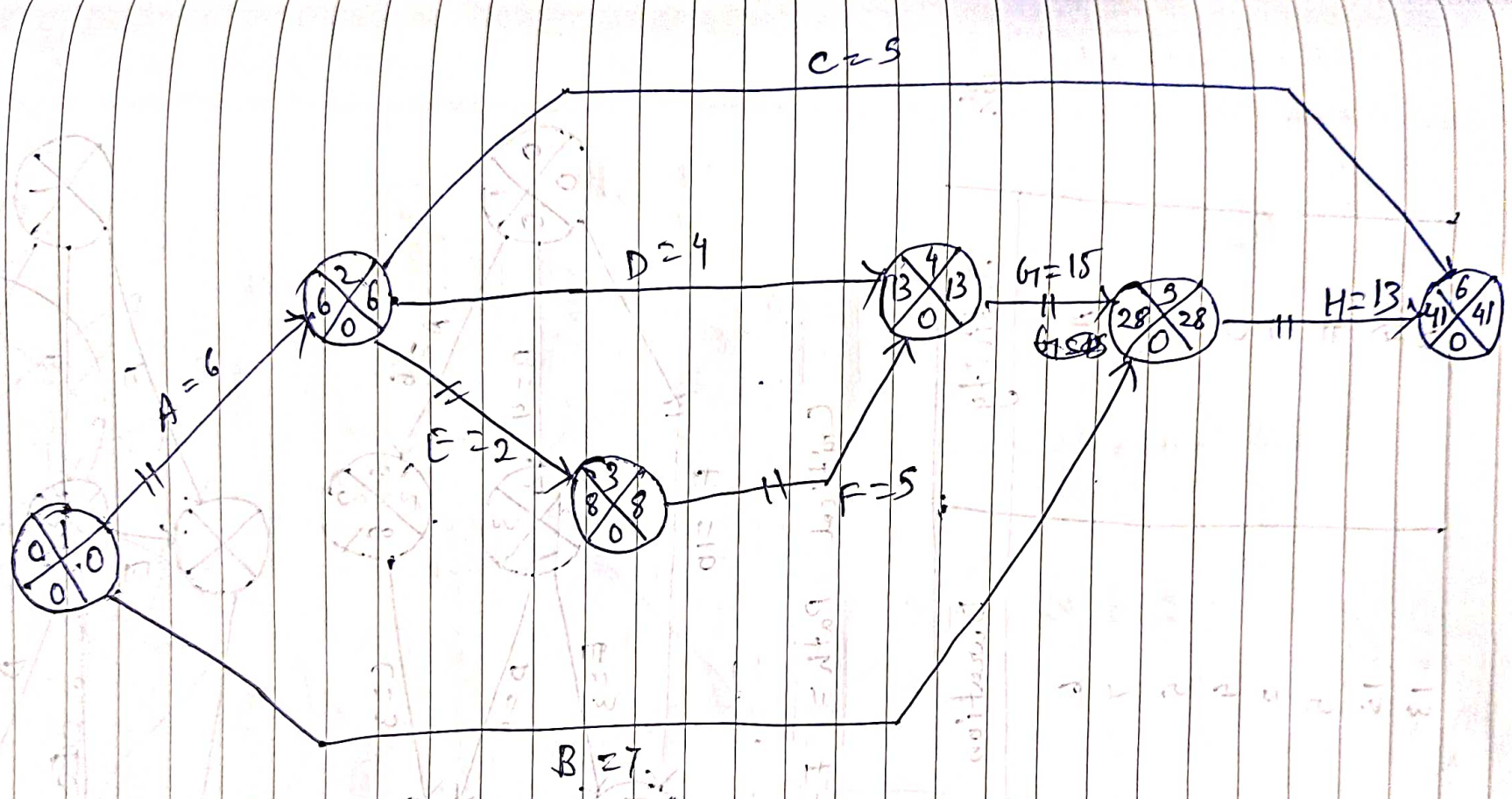




Critical Path = F → G , Duration = 13

8)

Activity	Duration	Precedents
A	6	
B	7	
C	5	A
D	4	A
E	2	A
F	5	E
G	15	D, F
H	13	B, G



Critical Path = A → E → F → G → H

PERT Technique

Activity	Optimistic Time a	Most Likely Time m	Pessimistic Time b
A	8	10	12

Expected duration, $t_e = \frac{(a + 4m + b)}{6}$

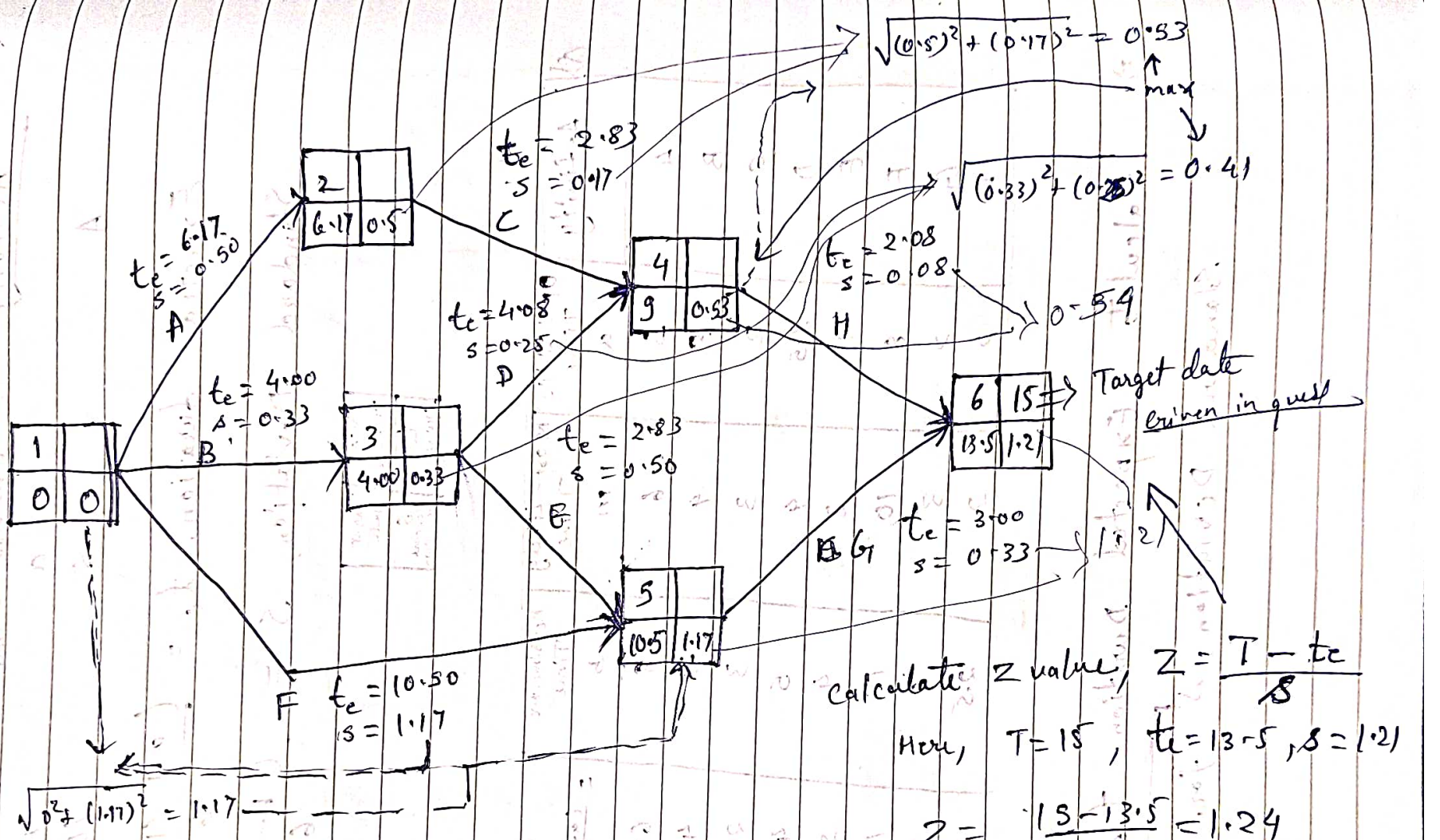
Standard Deviation, $S = \frac{(b - a)}{6}$

Event Number	Target Date
t_e Duration	S Standard Deviation

Q)

Activity	Optimistic Time a	Most-Likely Time m	Pessimistic Time b	$t_e = \frac{(a+4m+b)}{6}$	$S = \frac{b-a}{6}$	Precedent
A	3	6	8	6.17	0.50	
B	5	4	5	4.00	0.33	A
C	2	3	3	2.83	0.17	A
D	3.5	4	5	4.08	0.25	B
E	1	3	4	2.83	0.50	B
F	8	10	15	10.50	1.17	
G	2	3	4	3.00	0.33	E, F
H	2	2	2.5	2.08	0.08	C, D

⇒ Calculate Expected Duration, t_e & Standard Deviation, S for each activity.

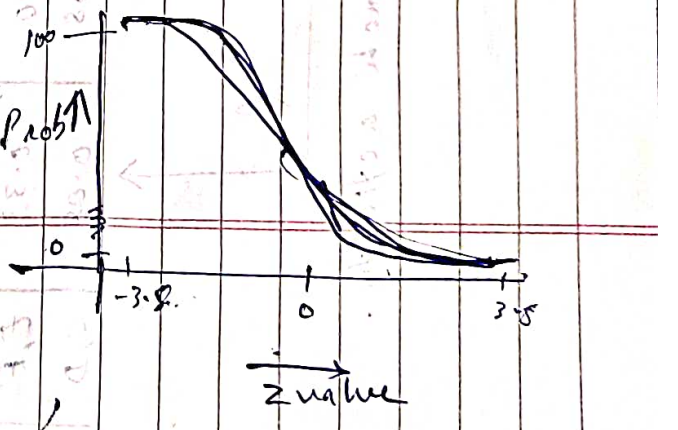


Calculate Z value, $Z = \frac{T - te}{s}$

Here, $T = 15$, $te = 13.5$, $s = 1.21$

$Z = \frac{15 - 13.5}{1.21} = 1.24$

Using Z-graph, based on Z value, find the probability of not meeting target date.



Risk Management

Risk

→ A risk is an uncertain event or condition that, if it occurs, has a positive or negative effect on a project's objectives.

→ A risk is the chance of exposure to the adverse consequences of future events.

Categories of Risk

* Project Risk – affect schedule or resources.

* Technical (Product) Risk – affect the quality or performance of the software being developed.

* Business Risk – affect the organisation developing or procuring the software.

* Sub categories of Business Risk

1. Market Risk :– building an excellent product or system that no one really wants.

2. Strategic Risk :– building a product that no longer fits into the overall business strategy for the company.

3. Sales Risk :– building a product that the sales force doesn't understand how to sell.

4. Management Risk :- losing the support of senior management due to a change in focus or a change in people.

5. Budget Risk :- losing budgetary or personnel commitment.

Software Risk

Risk	Affect	Description
Staff Turnover	Project	Experienced staff will leave the project before it is finished.
Management Change	Project	There will be a change of organisational management with different priorities.
Hardware Unavailability	Project	Hardware that is essential for the project will not be delivered on schedule.
Requirements Change	Project & product	There will be a large no. of changes in the requirements than anticipated.
Specification Delays	Project & product	Specification of essential interfaces are not available on schedule.

Size Underestimate	Project & product	The size of the system has been underestimated.
CASE tool under performance	Product	CASEtools which supports the project do not perform as anticipated.
Technology Change	Business	The underlying technology on which the system is built is suppressed by new technology
Product Competition	Business	A competitive product is marketed before the system is completed.

Framework for dealing with Risk

The planning for risk includes these steps:-

* Risk Identification — what risk might there be?
* Risk Analysis & Prioritisation — which are the most serious risks?
* Risk Planning — What are we going to do about them?
* Risk Monitoring — What is the current state of the risk?

Risk Identification

Approaches to identifying risk includes :-

* Use of Checklists — Usually based on the experience of past products.

* Brainstorming — getting knowledgeable stakeholders together to get their concerns.

Risk Assesment — Analysis & Prioritization

* Identify the damage & likeliness (probability) for each risk. This can be done by estimating the Risk exposure.

Risk Exposure, RE = (Potential Damage) X (probability of occurance)

Ideally,

Potential Damage : a money value eg- a fire in a datacentre would cause $500,000 of damage.

Probability : 0.00 (absolutely no chance) to 1.00 (absolutely certain) eg: 0.001 (one in a thousand).

$$RE = \$500000 \times 0.001 = \$500.$$

* The calculation of risk exposure assumes that the amount of damage sustained will always be the same.

* However there could be varying amounts of damage.
* With some risks, there could be not only damage but also gains.

Risk Assessment

* Most managers resist very precise ~~ext~~ estimates of loss or of the probability of something occuring, as such figures are usually guesses.
* Barry Boehm has suggested that, both the risk losses and the probabilities be assessed using relative scales in the range of 0 to 10. The two figures could then be multiplied together to get a national risk exposure. This value can then be used to prioritize importance the risks.

	Hazard	Likelihood	Impact	Risk Exposure
R1	Changes to requirement specification during coding	8	8	64
R2	Specification takes longer than expected	3	7	21
R3	Significant staff sickness affecting critical activities	5	7	35
R4	Significant staff sickness affecting non-critical activities	10	3	30

Risk - Planning

Risks can be dealt with:

* Risk acceptance - do nothing
* Risk avoidance
* Risk reduction and mitigation
* Risk transfer.

* A risk that has a potential damage of $40,000 and a probability of occurrence of 12% will be given a higher priority than a risk having a potential damage of $35000 and a likelihood of 14%. (True/False).

⇒ Risk Exposure, RE = Potential Damage * Probability of occurance (likelihood)

$RE_1 = \$40000 * 0.12 = \$48000$

$RE_2 = \$35000 * 0.14 = \$49000$

Answer - False.

Obviously, risk two should be given higher priority.

Risk Management

* Contingency

* Contingency Plan – A planned action to be carried out if the particular risk materializes.

* Example – Staff member is absent due to illness – replace with another staff member to cover the work.

* Deciding on Risk Actions.

* The counter measures considered must be cost-effective.

* The cost-effectiveness of a risk reduction action can be assessed by calculating the Risk Reduction Leverage (RRL)

* $RRL = (RE_{before} - RE_{after}) / (\text{Cost of risk reduction})$

* An RRL above 1.00 indicates that the reduction in risk exposure achieved by a measure is greater than its cost.

* Example

Risk Reduction Leverage, $RRL = \frac{(RE_{before} - RE_{after})}{(\text{cost of risk reduction})}$

RE_{before} is risk exposure before risk reduction

PTO

eg- 1%. chance of a fire causing $2,00,000 damage.

RE after is risk exposure after risk reduction.

eg: fire alarm costing $500 de reduces probability of damage to 0.5%.

$$RRL = \frac{(1\% \text{ of } \$200000) - (0.5\% \text{ of } \$200000)}{\$500}$$

RRL = 2 > @ 1.00, therefore worth doing.