CSE4708: Software Project Management

Unit III : Activity Planning & Risk Management

Topic:

Network Planning Model – Critical Path Method

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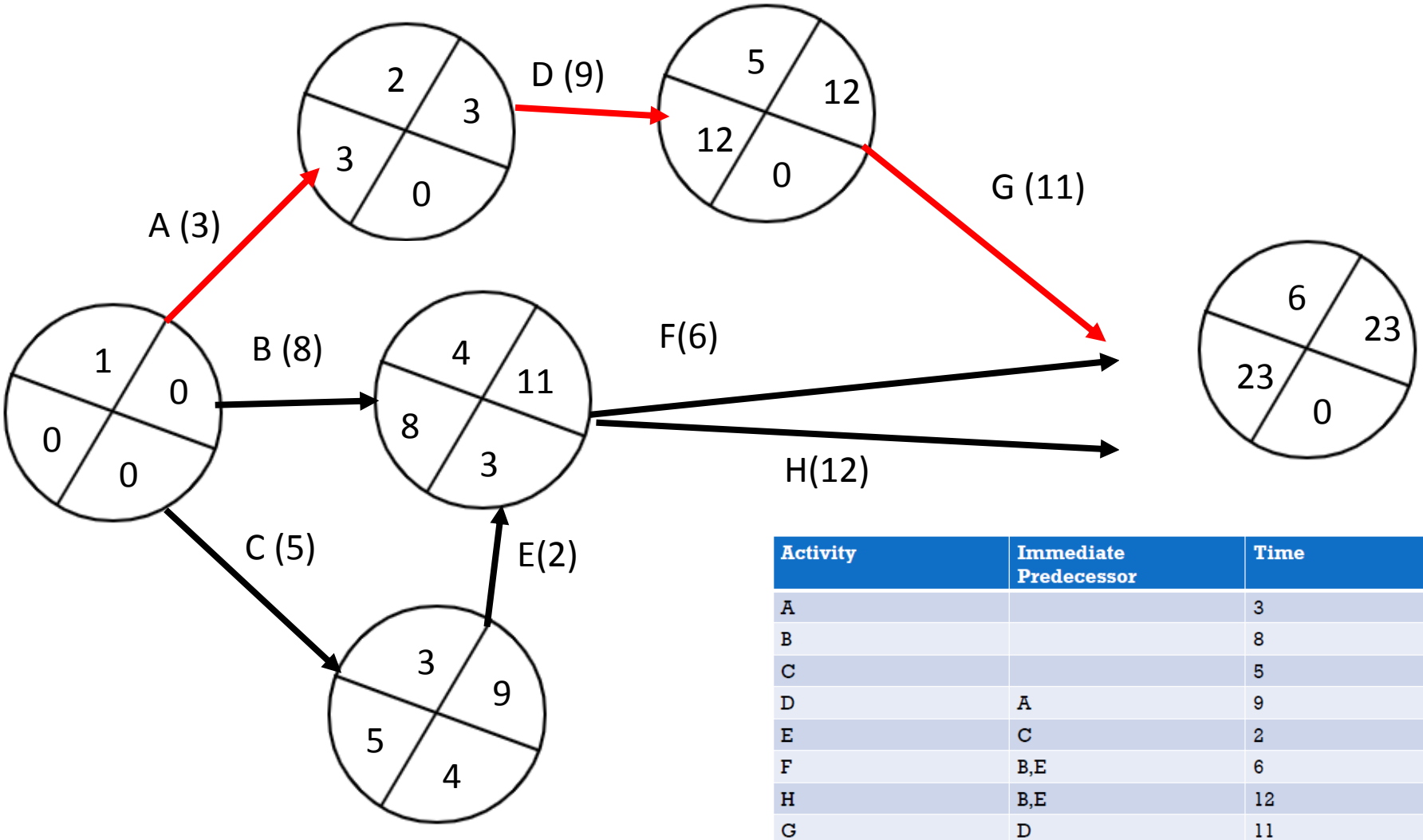
Critical Path Method

Activity	Immediate Predecessor	Time
A		3
B		8
C		5
D	A	9
E	C	2
F	B,E	6
H	B,E	12
G	D	11

- Find out the critical path and total float.

Critical Path Method



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Program Evaluation and Review Technique (PERT)

Program Evaluation and Review Technique

- Program (Project) Evaluation and Review Technique (PERT) is a project management tool used to schedule, organize, and coordinate tasks within a project

- It is basically a method to analyze the tasks involved in completing a given project, especially the time needed to complete each task, and to identify the minimum time needed to complete the total project.

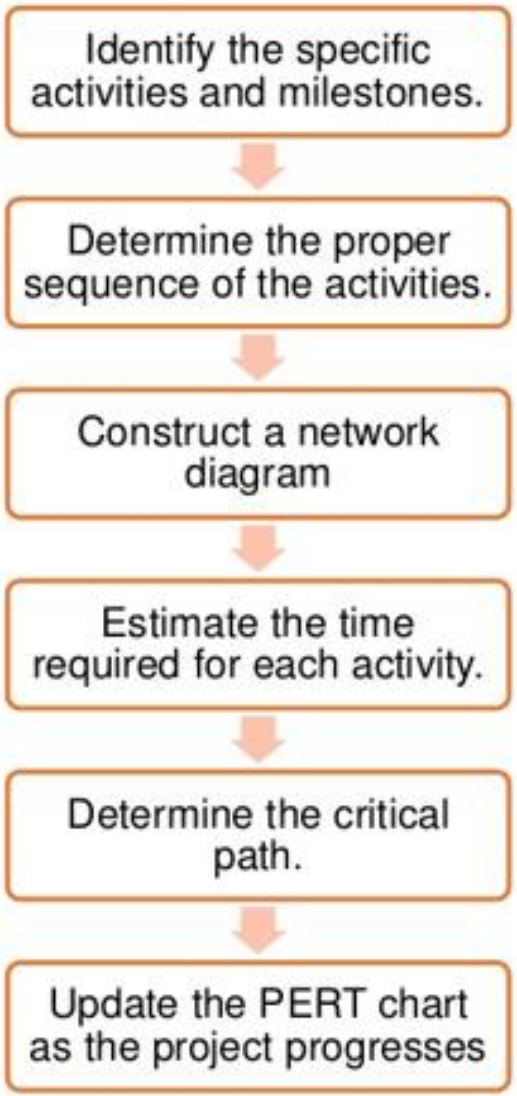
  - The main objective of PERT is to facilitate decision making and to reduce both the time and cost required to complete a project.

Program Evaluation and Review Technique

PREREQUISITES

- Personnel should already have a good understanding of formal project management terminology, tools, and techniques
- PERT form template of equivalent tool (e.g. software)
- Create of project plan
- Choose the most appropriate scheduling method
- Select and organize a team to perform project tasks.

Program Evaluation and Review Technique



Program Evaluation and Review Technique

IDENTIFY THE SPECIFIC ACTIVITIES AND MILESTONES.

- The activities are the tasks required to complete a project. The milestones are the events marking the beginning and the end of one or more activities. It is helpful to list the tasks in a table that in later steps can be expanded to include information on sequence and duration.

Program Evaluation and Review Technique

Determine the proper sequence of the activities

- This step may be combined with the activity identification step since the activity sequence is evident for some tasks. Other tasks may require more analysis to determine the exact order in which they must be performed.

Program Evaluation and Review Technique

CONSTRUCT A NETWORK DIAGRAM.

- Using the activity sequence information, a network diagram can be drawn showing the sequence of the serial and parallel activities.
- Each activity represents a node in the network, and the arrows represent the relation between activities.
- Software packages simplify this step by automatically converting tabular activity information into a network diagram.

Program Evaluation and Review Technique

ESTIMATE THE TIME REQUIRED FOR EACH ACTIVITY

- Weeks are a commonly used unit of time for activity completion, but any consistent unit of time can be used. A distinguishing feature of PERT is its ability to deal with uncertainty in activity completion time.
- For each activity, the model usually includes four time estimates:
  - ***Optimistic time***
  - ***Most likely time***
  - ***Pessimistic time***
  - ***Expected time***

Program Evaluation and Review Technique

TIMES

- ***Optimistic time***
- ***It is*** generally the shortest time in which the activity can be completed.
- ***Most likely time*** – the completion time having the highest probability. Note that this time is different from the *expected time.*
- ***Pessimistic time*** – the longest time that an activity might require.
- **Expected time** = (Optimistic + 4 x Most likely + Pessimistic) / 6
- This expected time may be displayed on the network diagram.

Program Evaluation and Review Technique

DETERMINE THE CRITICAL PATH.

- The critical path is determined by adding the times for the activities in each sequence and determining the longest path in the project.
- The critical path determines the total calendar time required for the project.

Program Evaluation and Review Technique

UPDATE THE PERT CHART AS THE PROJECT PROGRESSES.

- Make adjustments in the PERT chart as the project progresses.
- As the project unfolds, the estimated times can be replaced with actual times.
- In cases where there are delays, additional resources may be needed to stay on schedule and the PERT chart may be modified to reflect the new situation.

Program Evaluation and Review Technique

BENEFITS OF PERT

PERT is useful because it provides the following information:

- Expected project completion time;
- Probability of completion before a specified date
- The critical path activities that directly impact the completion time;
- The activities that have slack time and that can be lend resources to critical path activities;
- Activity start and end date.

Program Evaluation and Review Technique

- Example

  - In the following example, the Project manager knows the succession of the project activities and the optimistic, pessimistic and most likely time (in weeks) for the following activities:

Program Evaluation and Review Technique

Activity	Description	Predecessors	Optimistic time (O)	Pessimistic time (P)	Most likely time (M)	*Expected time (O+4M+P)/6*
A	Select administrative and medical staff.	-	9	15	12	*12*
B	Select site and do site survey.	-	5	13	9	*9*
C	Select equipment.	A	8	12	10	*10*
D	Prepare final construction plans and layout.	B	7	17	9	*10*
E	Bring utilities to the site.	B	18	34	23	*24*

Program Evaluation and Review Technique

F	Interview applicants and fill positions in nursing support staff, maintenance, and security.	A	9	15	9	*10*
G	Purchase and take delivery of equipment.	C	30	40	35	*35*
H	Construct the hospital.	D	35	49	39	*40*
I	Develop an information system.	A	12	18	15	*15*
J	Install the equipment.	E, G, H	3	9	3	*4*
K	Train nurses and support staff	F, I, J	7	11	9	*9*

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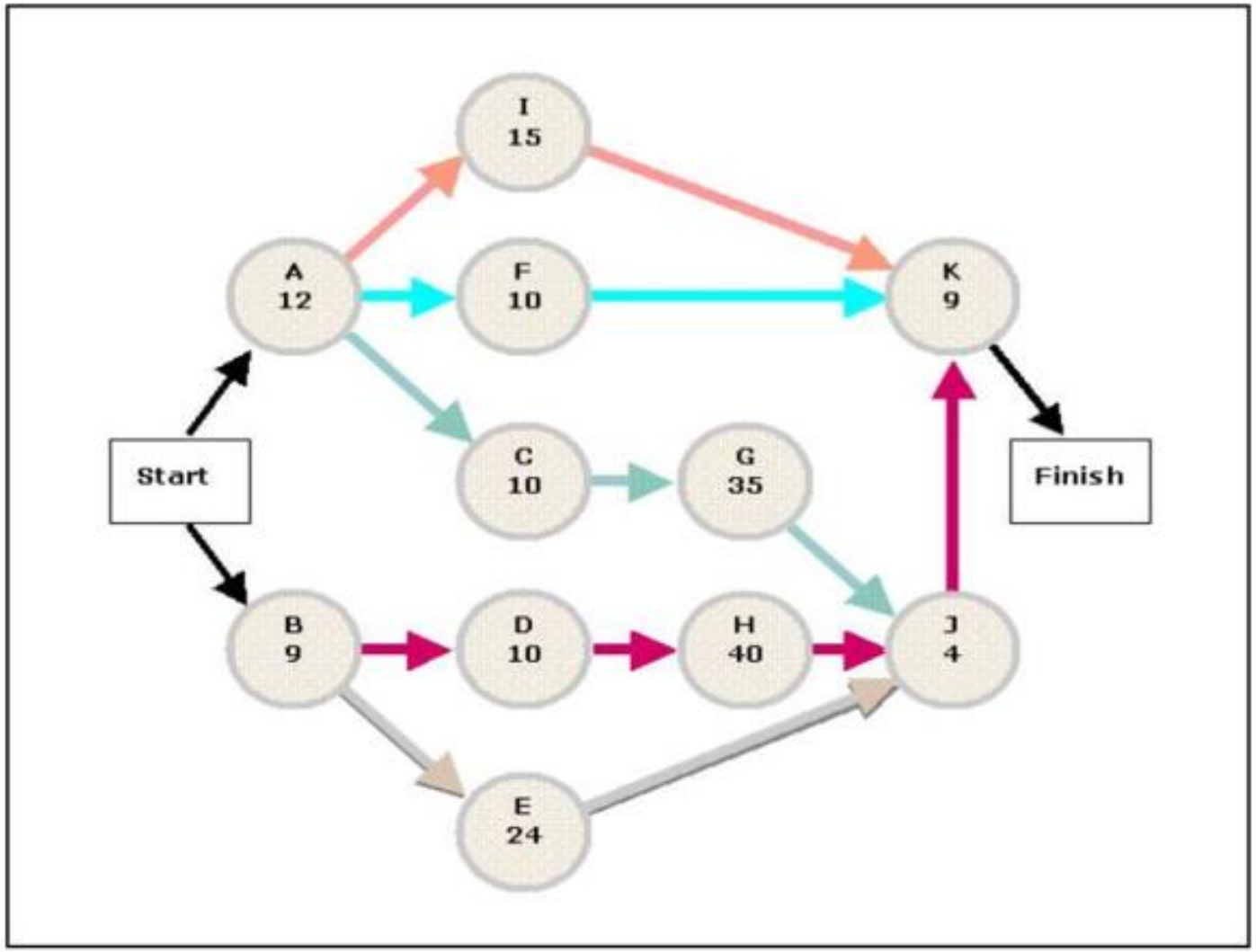
The associated network is:



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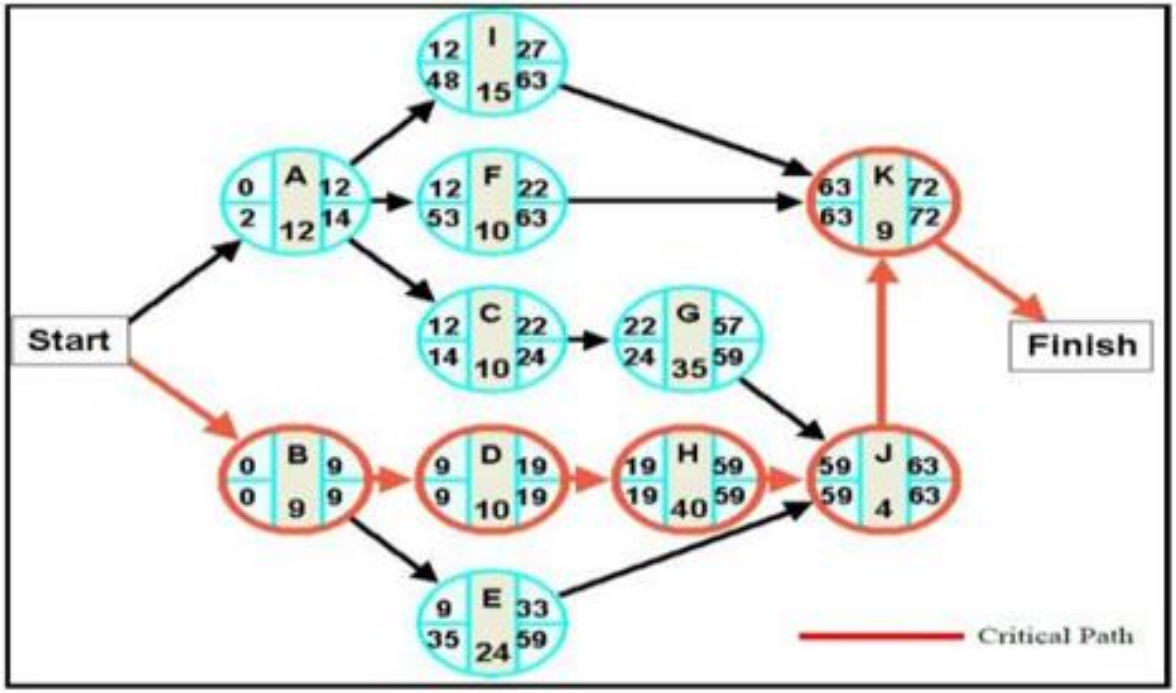

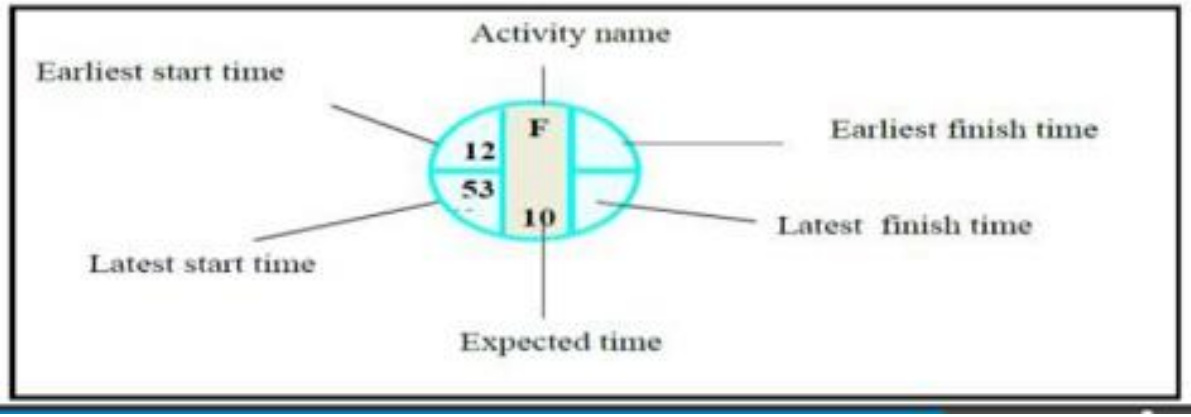

Program Evaluation and Review Technique

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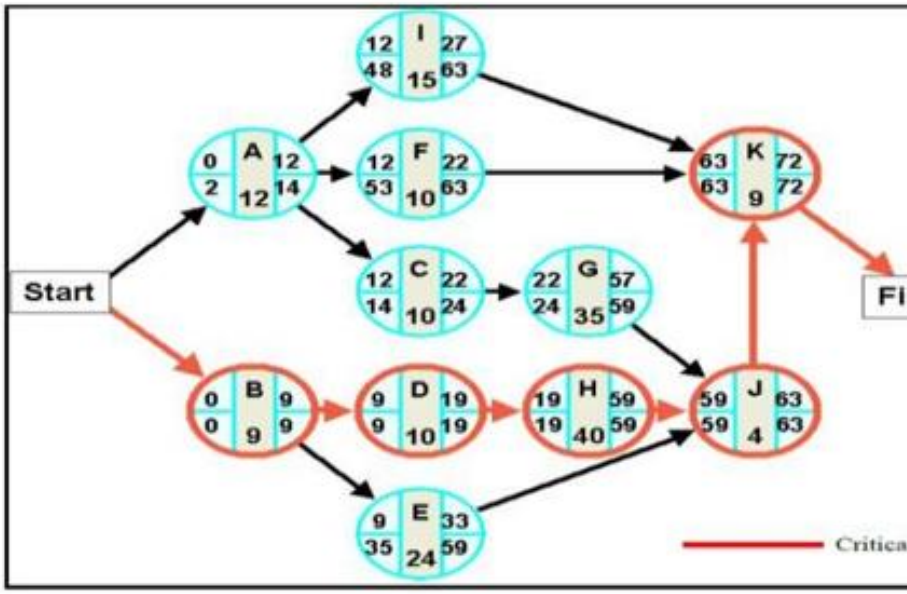

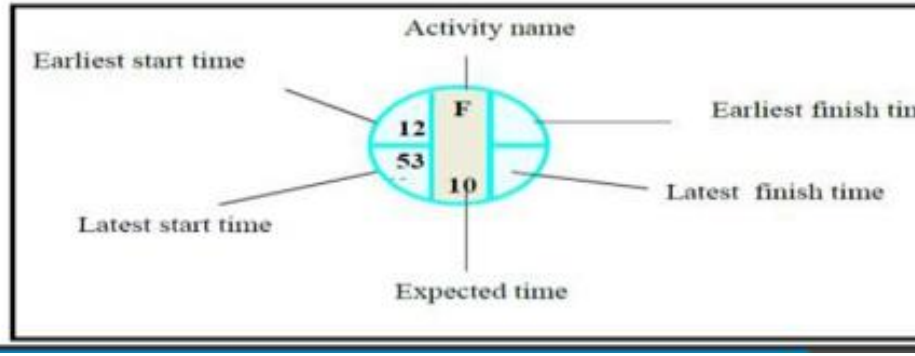

Practice Question

A small project consisting of eight activities has the following characteristics:

Time – Estimates (in weeks)

Activity	*Preceding activity*	*Most optimistic time (a)*	*Most likely time (m)*	*Most Pessimestic time (b)*
A	None	2	4	12
B	None	10	12	26
C	A	8	9	10
D	A	10	15	20
E	A	7	7.5	11
F	B,C	9	9	9
G	D	3	3.5	7
H	E,F,G	5	5	5

(i) Draw the PERT network for the project.

(ii) Prepare the activity schedule for the project.

(iii) Determine the critical path.

Practice Question

A small project consisting of ten activities has the following characteristics:

Activity	Preceding Activity	Time Estimate weeks		
		Optimistic	Most likely	Pessimestic
A	–	4	5	12
B	–	1	1.5	5
C	A	2	3	4
D	A	3	4	11
E	A	2	3	4
F	C	1.5	2	2.5
G	D	1.5	3	4.5
H	B,E	2.5	3.5	7.5
I	H	1.5	2	2.5
J	F, G, I	1	2	3

Determine the critical path

Recommended Reading

- Pressman, Roger S., “Software Engineering – A practitioner’s Approach”, “Chapter -7: Project Scheduling and Tracking”, 5th edition.
- https://www.tutorialspoint.com/management_concepts/critical_path_method.htm