Dr. Raquibul Hossain

Slide-1 (Introduction)

Lec-1

- Project's or Engineer's Life Cycle :

  বাংলাদেশে শুধু Delivering the project ← এই stage টাই আছে, অন্যগুলো নেই।

- Where are we now ?

  2nd stage → Raquib Sir

  4th stage → অন্য স্যার

- What tools / building blocks are we learning ?

  Dark blue → for 4-1 term

Slide-2

Leading and Managing Teams

① a) Human resource management : Role of HRM

b) HRM : How to effectively manage human resource

Micro manager হওয়া উচিত না।

self managed team ভাল

* Symbolic Egalitarianism :

কেউ higher level এ চলে গেলে তাকে ছাটাই করে সেন্সা বা lower

সবাইকে average level এ রাখা।

Lec-2

- C1: Human Resource Management : Example

  Golder Associates → Largest farm for Geo-tech Engineering

Assignment:

"5 Dysfunctions of Teams" by Patrick Lecioni

- C2 : Team- Group Vs Team :
  - 5 Dysfunctions of team
  - 7 Characteristics of high performing teams
- C3: Team development : Stages :

Lec-3

C3: Team Development : Stages

- Forming
- Storming
- Norming
- Performing

Lec-4

C3: Types of Conflict:

- Relationship Conflict ⊗ (bad)
- Task " (sometimes good - sometimes bad)
- process " (")

cognitive process—

C4: → Team Conflict : Impact on Team Outcome:

→ Team conflict: Impact Moderators

- lower row → examples

Collaborative conflict → সবাই মিলে conflict reduce করা আলোচনা করার মাধ্যমে

Moderator হলো ইন adverb

→

→ High performance Team

→ Low " "

Lec-5

C4: Leading Team:

* Initially process conflict introduce করতে হবে। then task conflict.

→ Use of emotional intelligence
  • empathy সবচেয়ে important
→ create perception of Justice
→ Introduce self managing team
→ Decision making : process or event

C5:→ Absence of Candor / openness:
  → Effect of groupthink
  → Devil's advocacy process

Team এ এমন একজনকে assign করা, যে সব কিছুতেই, সব process এই Q. করবে।
It helps to critically evaluate all the assumptions a team makes.

→ Dialectical inquiry process: (better than advocacy)
  small team form করা যারা নিজেদের মধ্যে argue করে final decision এ পৌঁছে।

* এই process না করা গেলে at least advocacy process follow করতে হবে।

→ Making good & Timely decision :

Lec-6

Project Operation Management

→C1 : Inventory Management : The Process view

- $\frac{\text{Inventory}}{\text{Flow time}} = \text{Flow rate}$
- Inventory consider করার সময় avg. inventory নিয়ে কাজ করতে হবে।

C1 : Reasons for holding Inventory :

→C1 : Disadvantage of Low inventory turns

→C1 : EOQ Model

→C1 : Assumptions

* Annual holding cost per unit is independent of কতবার order করছি।

$C_H \times \frac{Q}{2}$

$\frac{Q}{2}$ ← এতটুকু hold করতে হবে unit

C_H ↑ holding cost per unit

$\therefore$ holding cost $= \frac{Q}{2} \cdot C_H$

$\frac{U}{Q}$ → কতবার order করব

C_o → per order cost

$\therefore$ Total order cost $= \frac{U}{Q} \cdot C_o$

$\therefore$ Total cost $= \frac{Q}{2} \cdot C_H + \frac{U}{Q} \cdot C_O$

* বেশি order বসালে, holding cost বাড়বে
* " " " , no of order কমবে, so, order cost কমবে।

* Lead Time requirement check বসাতে হবে।

→ C1: Just-in-Time

Kanban → একটা system

জাপানী শব্দ → সিঁকবার

Lec-7

→C2: Demand Forecasting : Newsvendor model For optimal inventory

→C2: Reviewing statistics :

normal distribution → mean
st. deviation

→ assumptions :

* বেশি order করে লাভ বেশি আছে, যেটা loss overcome করেও বেশি হয়। so, overall profit হয়।

* mainly depend করে profit - loss এর value এর উপর

Math → বড়টার জন্য z নিব যদি ২টা value থাকে।

→ Final Thoughts

Lec-8

→C3: Labour and Plant Management :

— Task Duration.

• যে slowly কাজ করে, তার উপর Task duration depend করে।

$84.6\% = \frac{4.61}{5.71}$

$\frac{4.61}{7.5} = 61.5\%$

* New worker নিতে হবে।

* ২য় জনের কিছু Task 3rd জনকে দেয়া

* Line balancing এর মাধ্যমে productivity বাড়ানো যায়।
* parallel process চললে balancing হয়।

→ Leagal & Ethical Issues:
→ Anti discrimination
→ Responding to workplace bullying
→ standards and ethics

Lec-9 { মঙ্গলবার ৯:০০টায় C.T

C4: Procurement : Value for money

– Risk Transfer :

PPP ← interest value বেশি, তাই cost of capital বেশি। (private sector Investment)

GOB ← Government investment : interest rate কম।

কিন্তু risk factor চিন্তা করলে GOB তে Total cost higher than PPP. তাই BD তে বড় বড় project হয় PPP তে।

• Infrastructure procurement এ consider করব –
1) future risk
2) cost
3) quality
} to ensure value for money

- Procurement Method :

1)

2) Design- Build Procurement :

- Design + Build
- supervision লাগে (3rd party consultant, quality check করবে)

3) + maintenance

4) Turnkey procurement [PPP করলে EPC আসে]

5)

- FIDIC Document : 1 of st. procurement document

Lec-10

C5: Environmental Regulations : Law

C6: Case discussion

Lec-11

- Project Evaluation : (early stage evaluation)

— Time value of money

জিনিসপত্রের দাম বাড়তেও পারে, কমতেও পারে

বিনিয়োগ

- আজকের → কালকে → bigger করব
- কালকের → আজকে → smaller (বেচে দিব)

• চক্রবৃদ্ধির rule (সুদমিল এর জন্য) apply হবে। (compounding)

Example

• Rule of 72 :

• Present value :

• Present values are additive :

• Solving for

1. $FV = 500(1+0.12)^{10} = 1552.92 \approx 1553$

2. a) $FV = 1000(1+0.10)^6 = 1772$

   b) $FV = 125.47(1+0.12)^8 = 311$

3. $4,000,000 = P.V(1+0.10)^{30}$

   $\therefore P.V = 0.23$ million

4. $200 = 100\left(1+\frac{r}{100}\right)^7$

   $\Rightarrow 2^{1/7} = 1+\frac{r}{100}$

   $\therefore r = 10.4\%$

   using rule of 72 $\rightarrow \frac{72}{7}$

5 $150 = 100\ (1+0.10)^n$

$\ln \frac{3}{2} = n \ln(1.10)$

$n = 4.25$

direct solve

Function তে লিখে

Shift → solve → =

× Lec-12

8

9 1% interest per month

present → 45,000

$r \rightarrow 1\%$

A

Annuity

$A \times \frac{(1+r)^n - 1}{r} =$ Known

$PV = A\left[\frac{1-(1+r)^{-n}}{r}\right]$

$PV = \frac{A}{r}$ ← perpetuity

Lec-12

Compound → চক্রবৃদ্ধি

quarterly compounding →

- Bank এ loan নেবার সময় → effective interest rate বলে। (যেটা actually পরিমাণে কম show করে)

But actually Bank এ daily interest rate compound হয়।

- Annuity

$$FV_n = A \left[\frac{(1+r)^n - 1}{r} \right]$$

(r → Discount rate; A → Fixed Cash Flow)

Example:

$r = 0.09$, $FV_n = 2$ million

$$2 \text{ million} = A \left[\frac{(1+0.09)^{35} - 1}{0.09} \right]$$

$\therefore A = 9271$

present value of an annuity:

$$PV = A \left[\frac{1 - (1+r)^{-n}}{r} \right]$$

Example

$r = 0.1$, $n = 2$ years, $A = 50{,}000$

$PV = 453852$

Perpetuity Fixed cash flow that will continue always/ forever.

$$PV = \frac{A}{(1+r)^1} + \frac{A}{(1+r)^2} + \frac{A}{(1+r)^3} + \cdots = \frac{A}{r}$$

example $PV = \frac{A}{r} = \frac{10{,}000}{0.1} = 100{,}000$

Problem

8 $A = 1000 \times \frac{1.12^{10} - 1}{0.12} = 17548$

9 $450{,}000 = A \frac{1 - 1.01^{-48}}{0.01}$ $r = 0.01$

$\therefore A = 1185$

12 $PV = 5000/0.08 = 62500$

Effective annual rate example:

12%. quarterly compounded

12/4 = 3 %

quarterly compound [1st quarter পর যে টাকা হবে with int 3%., 2nd quarter এ সেই total এর উপর 2nd quarter এর 3% interest আসবে।

12% daily compounded,

$$r = \left(1 + \frac{0.12}{365}\right)^{365} - 1 = 12.7\ \%$$

Application Mortgages → slide দেখে পড়ে নিব।

Bank → daily compound

Lec-13

Investment Decision:

Estimating Relevant cash flow:

Consistency principle:

- NPV:

$$NPV = \sum_{t=0}^{T} \frac{NCF}{(1+r_p)^t}$$

ভবিষ্যতের both input & output cash কে present value তে convert করলে যা পাওয়া যায়।

$$44000 = \left(1+\frac{10}{100}\right)^1 PV$$

$$\therefore PV = \frac{44000}{\left(1+\frac{10}{100}\right)^1} = 40{,}000$$

44000 → 36363.67 = 36364

44000 → 33057.85 = 33058

44000 → 30052.59 = 30053

44000 → 42843.57 = 42844

69000 →

$$NPV = -175000 + 40000 + 36364 + 33058 + 30053 + 42844$$

$$= ₹319$$

- Eurotunnel NPV:

-ve → খরচ করছি / invest
+ve → income হচ্ছে

- IRR computation:

$$NPV = \sum_{t=0}^{T} \frac{NCF}{(1+IRR)^t} = 0$$

যেই rate এ NPV zero

$$-175{,}000 + \frac{44000}{(1+IRR)} + \frac{44000}{(1+IRR)^2} + \frac{44000}{(1+IRR)^3} + \frac{44000}{(1+IRR)^4} + \frac{69000}{(1+IRR)^5} = 0$$

$\therefore$ IRR = 11.5 %

$$-175 + \frac{44}{(1+IRR)} + \frac{44}{(1+IRR)^2} + \frac{44}{(1+IRR)^3} + \frac{44}{(1+IRR)^4} + \frac{69}{(1+IRR)^5} = 0$$

Shift → solve → [=]

- Multiple rate of return:
- Ranking conflict:

* যে project এ দ্রুত টাকা return করে সেরকম project এ IRR বেশি হয়।
* Long term project এ NPV value higher.

Lec-14

Lec-15

Project Feasibility

- Financial Feasibility
- Financial Revenues
- Project cost
- C1 → Cost of Capital
  → Sensitivity and risk analysis
- C2 →

Lec-16

Feasibility Assesment

Economic Feasibility

C3 → Methodology
- Benefit
- Example
- Discount rate (BD govt. → 15%)
- cost

Finantial

Financial discount rate ≠ Economic discount rate

* কোন সংখ্যার ২পাশে ( ) sign এর অর্থ হল তাহা -ve number.

C4 → Case study

Q5 : Report Outline

Dr. Rupok Matsuddy

Lec-1

Construction Management

Topics

1) Principles of management
2) Construction management :
   - principles
   - project organization
   - methods and practices
   - technology
   - management of material and equipments
   - site management
   - contracts and specifications
   - inspection and quality control
   - safety
   - economy

Reff

1) A guide to the project management body of knowledge (soft copy আছে)
2) Project management techniques in planning and construction projects – Ahja H., Dozzi S. & Abou Rizk's (1994)

Class note নিজেকেই হবে

Project:

Temporary endeavor undertaken to create a unique product or service.

Project management:
Application of knowledge, skills, tools and techniques to project activities to meet project requirements.

Lec-2

Project:

unique → ex. geographic location & other parameters vary from project to project.

Project Management:
Relationship to other Management Disciplines:
Fig: 1-2.

Project Management Context:
1) project phases and project life cycle
2) Project stakeholders
3) Organizational influence
4) Key General Management skills
5) Socio economic influences

→ Project phases & Life Cycle :

Fig 2-1:

Fig 2-3: Representative construction project Life Cycle

Q. Yaxis value zero থেকে start হয়নি কেন?

→ Project Stakeholders :

- project Manager
- customers
- performing organization
- project team members
- sponsor

→ Organizational Influence :

* projects are typically part of organization larger than project itself
  - Govt. agencies
  - corporation
  - Healthcare institution

* Sometimes project is larger than agencies – joint venture.

- Systems

– Derive revenue from project
– Management by project

} project based organization,

→ Non project based organization :

১। contractors
২) consultants
৩) designers
} project based organization
They derive revenue from project
project না থাকলে revenue পাবে না

১) manufacturers
২) financial management org.
} Non project based org.
তাদের revenue direct
project থেকে আসে না

* organizational Culture & Style
* organizational Structure

Fig 2-6

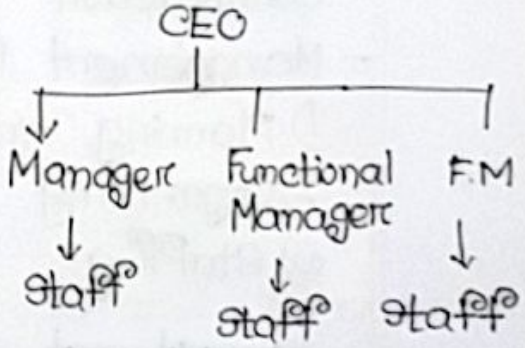
* classic Functional organization (weak) Fig 2-7
* projectized (strong) " Fig 2-8
Fig 2-9
Fig 2-10
Fig 2-11
Fig 2-12

Lec-3

Project Management Context:

১ - Project phases and project life cycle
২ - project stakeholders
৩ - Organizational influence
৪ - key General management skills
৫ - socio economic influence

(৪) skills → 1) Leading
2) Communicating
3) Negotiating
4) Problem solving
5) Influencing the organization



Q. Difference betn risk management and problem solving?

ভবিষ্যতের problem manage করা।

present problem solve

(৫) influence → ১) standards and regulations

'For standard, complaince (বাধ্য) is not mandatory' → we are not bound to follow the procedure.

regulations → complaince is mandatory → bound to follow the procedure.

Lec 1-3 C.T
subjective Q.
1st slide full,
2nd এর ৯ম ৮টা

2) Internationalization :
3) Cultural Difference :

Lec-4

•Construction Management :
- Economic importance of construction industry
- BD context এ কিকি ধরনের construction কাজ হয় ?
- Construction
- Management Process : Factors
  1) Planning and decision making
  2) Organizing
  3) Staffing

* recruitment ও selection এর পার্থক্য
আগে recruitment, then selection.

  4) Directions and communication.
  5) Controlling

— Problems encountered in Construction industry
  a) Time overruns
  b) cost overruns
  c) Deficiency in quality of work
  d) Lack of Harmony

Lec-5

Lec-6

- Construction management :

— safety

Lec-7

- Quality Control :

— Project quality management:

↪ — 8.1, 8.2, 8.3

- Quality Planning:

— Tools & Techniques

less durability → concrete এর মধ্যে void বেশি। so, water ঢুকে রডে মরিচা ধরে, যখন সেটা load নিতে পারে না, এবং concrete এ pressure দেয়। যখন concrete ক্ষয় হয়ে যায় ও ultimately fail করে।

— Output

Lec-8

Lec-9

- Cost Budgeting:
- Cost control:
- Construction Management:

Rupak sir → ২টা Q
Kabirul ↳ → ২টা Q
Roquibul ↳ → ৪টা Q

PM Book guide
+ slide পড়তে হবে

Md. Kabirul Islam

Lec-1

Microsoft Project Tool

Topics:

1) Planning and scheduling, resource scheduling (2-3)
2) PERT, CPM (Critical Path Method) (4-5)
3) Linear programming and application (4-5)

Project Management

Lec-2

Project Plan:

Why is project planning needed?

How do we use a project plan?

Components of project planning:

- charter (means objective)

Step 1 : Project Goals

Lec-3

- Project Scope and Project scope planning
- Project planning process

Step 1: Set project goals:
Step 2:
Step 3:

WBS → Work Break Down Structure

Step 4: Supporting plans: (next class)

Lec-4

Notes on →

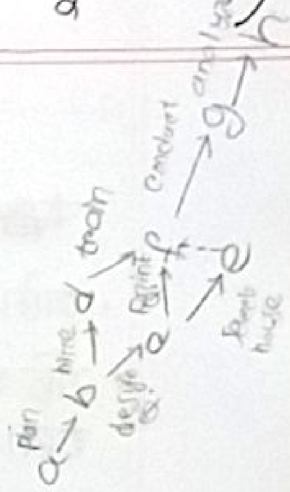
• WBS:

→ Organogram: Example 1.
Example → Human Resource Plan

→ Project Cost planning
→ Risk Management plan
→ Example of common project risk
→ Project Quality Plan
→ Summery of the project planning process

এই Topic শেষ

{23/10/18 তারিখ C.T রবীন্দ্র স্যারের}

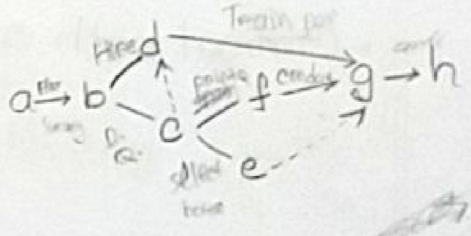


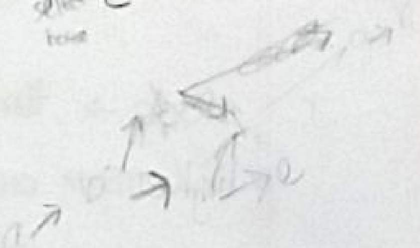
Lec-5

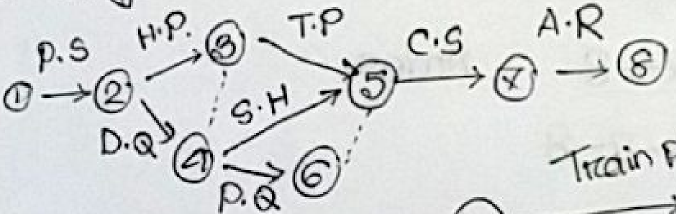
CPM and PERT

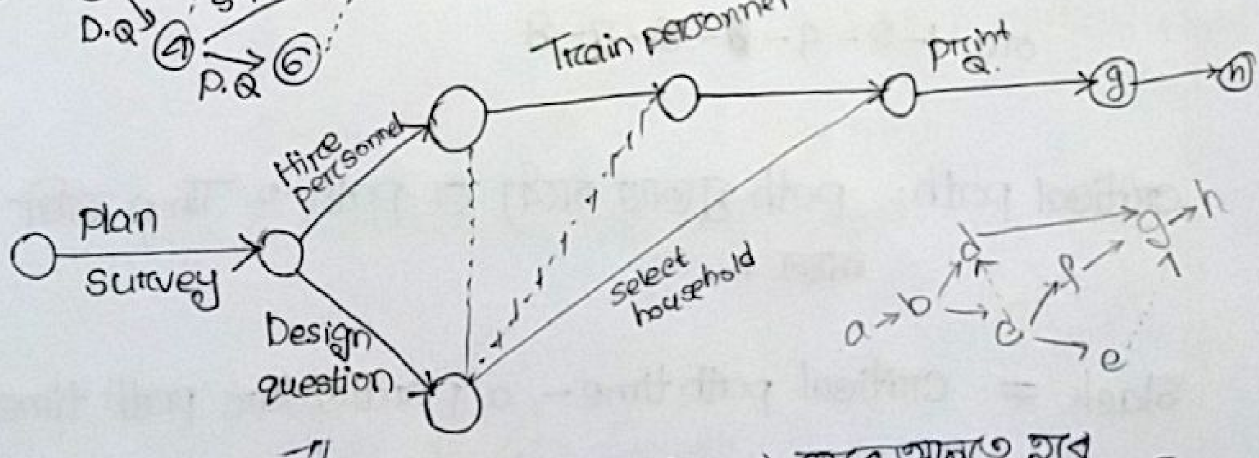
Dummy activity preserves logical relation shown by dashed line

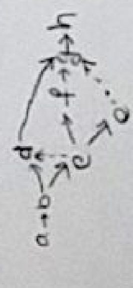
		depend upon
a	1) plan survey	
b	2) Hire personnel	a
c	3) Design question	a
d	4) Train personnel	b, c
e	5) select household	c
f	6) print questionnaire	c
g	7) conduct survey	d, e, f
h	8) Analyze result	g











এটা CT তে থাকবে এবং Draw করে আনতে হবে
Board এ আঁকতে দিবে।

Lec-6

~~Net~~ • Network Diagram or Network- Survey

• যেটা করতে বেশি সময় লাগে, তোর শেষ হলে project শেষ হবে।

• প্রতি node কে অবশ্যই connect করে একটি activity থাকতে হবে। না থাকলে dotted line দিয়ে connect করব।

• যে কাজ করতে বেশি সময় লাগে → critical path. এটা constant না।

• Critical path এ কোন slack নাই।

Lec-7

node → time indicate

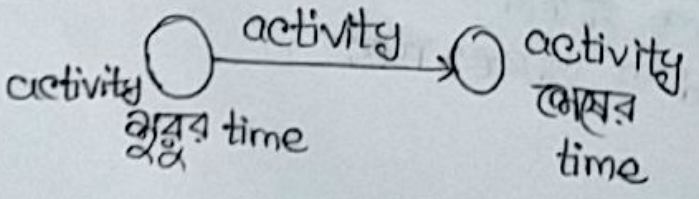
linkers → activity indicate

path : 1- 2- 3- 5- 7- 8 nodes

or 1-2-4-6-5-7-8

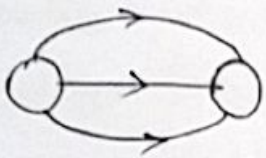
critical path: path গুলোর মধ্যে যে path এ Time বেশি লাগে।

Slack = Critical path time - a particular path time

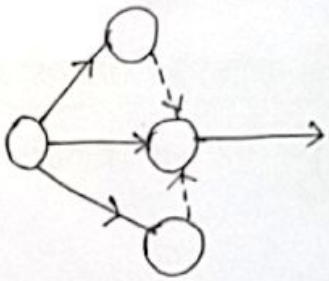


- দুটি node এর মাঝে একটিই activity থাকবে।

- একটি node থেকে একাধিক activity বেরুক হতে পারে। এটা represent করে activity গুলো একই সাথে শুরু হচ্ছে।



not possible



- zero time এ শুরু হচ্ছে → 1) Interview
  2) Locate facility

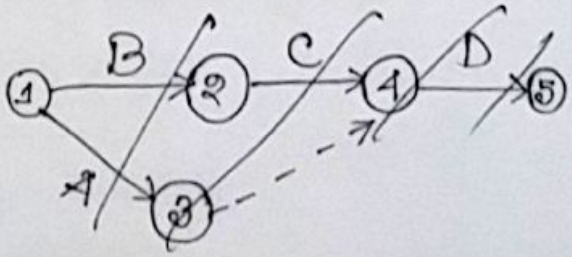
5 no. এ আসতে time লাগে

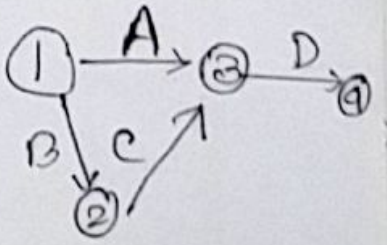
$8+6+3 = 17$ $(1 \to 2 \to 4 \to 5)$

$8+11 = (19)$ $(1 \to 2 \to 5)$ critical path

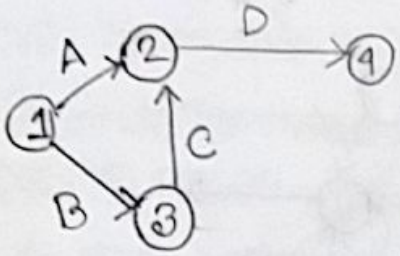
$4+9 = 13$ $(1 \to 3 \to 5)$

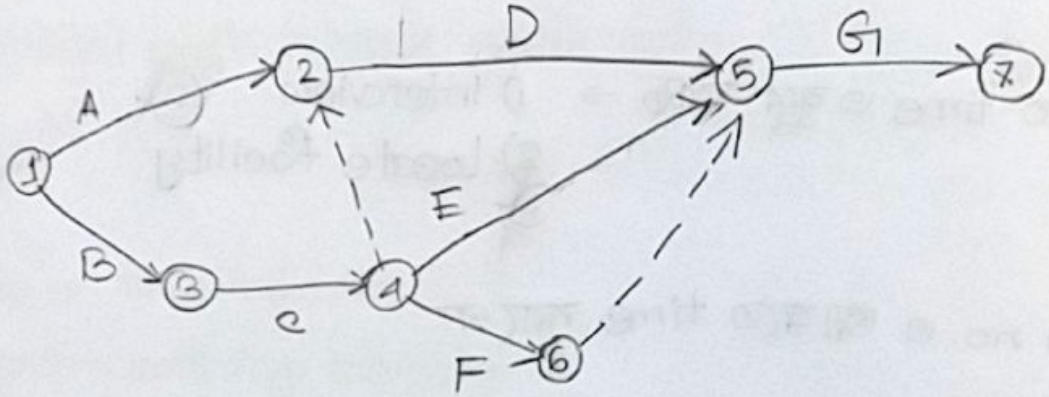
∴ 5no. এ আসতে time লাগবে 19 week.

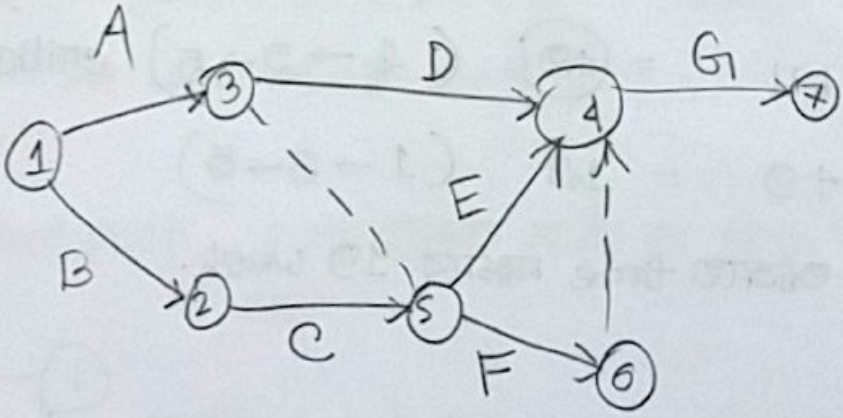




Ex-2







Lec-8

- Critical Path Analysis:

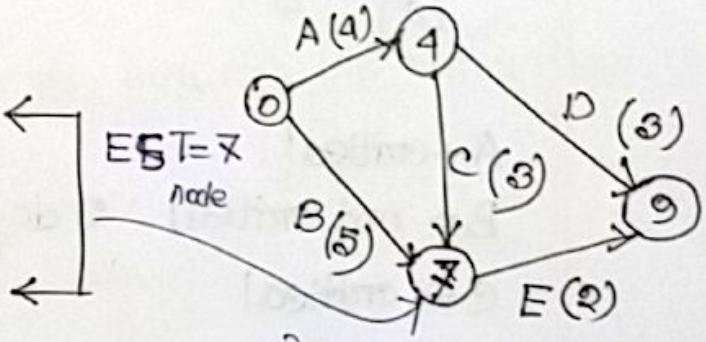
predecessor → আগের activity

- earliest start time + time to complete the task = earliest finish time
  (time to complete the task = duration of the task)

C, D এর জন্য EST = 4

C এর EFT = 4 + 3 = 7 (4 = EST, 3 = duration)

B এর EFT = 0 + 5 = 5



E → EFT = 7 + 2 = 9
D → EFT = 4 + 3 = 7
} EFT = 9

এই node এ যতগুলো activity শেষ হয়েছে তাদের EFT বের করতে হবে। এদের মধ্যে Max EFT টা হবে EFT of that node.

A [EST, EFT]

- Latest start time:

[Earliest finish time = latest finish time]
[ex. considering no delay day]

EFT + Delay = LFT

LST = LFT − duration
= EFT − duration

C [4, 7] 4, 6
D [6, 9] minimum টা নিব।

node থেকে যেই activity গুলো বের হচ্ছে তাদের EST এর মধ্যে minimum টা হবে ঐ node এর ~~EST~~. LST.

A [0, 4]
LST LFT

Red → Earliest
Blue → Latest

A → critical
B → not critical 2 day delay possible
C → critical
D → not critical. EST ~ LST = delay. 2 day delay possible
~~= Float~~
= Float
E → critical

A → C → E (critical path) একদিনও delay করা যাবে না।

- কোন একটা কাজের duration change হলে, সুরো critical path change হয়ে যায়।
- Node notation বাদ।
- slack → delay করা যায়।

2G → EFT বা LFT

LFT আগের বের করব।

LST = LFT - duration ← যেটা LST এর max তা নিব

~~EST থেকে শুরু করব~~

- Using Beta Probability:

(expected time, varience)

EST duration

V → critical path এর প্রত্যেক টা activity এর varience এর যোগফল

Lec-9

Linear Programming & Optimization

$m = n$ → no. of variable

no. of equation

$[A]\{x\} = \{b\}$

Row → eqn no.

Colm → variable no.

$$\begin{cases} f(x) = C^T \cdot X \\ \text{subject to} \\ AX = b \\ X \geq 0 \end{cases}$$

$$\begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ a_{m1} & a_{m2} & & a_{mn} \end{bmatrix} \begin{Bmatrix} x_1 \\ x_2 \\ \vdots \\ x_n \end{Bmatrix} = \begin{Bmatrix} b_1 \\ b_2 \\ \vdots \\ b_m \end{Bmatrix}$$

- If $m > n$ → কোন soln থাকবে না

(m = no. of equation, n = no. of variable)

- if $m < n$ → infinite set of soln. (generally)
- $x_{n+1} \geq 0$ (less than type)
- $x_{n+1} \leq 0$ (greater than type)
- $x \leq 0$ ← soln গুলো বাদ দিবে।

★ Test

Lec-10

- Non convex হলে soln বের করা যাবে না।
- Blue ও white both region এ নড়লে → non convex.
- যে কোন দুইটা point (corner) add করে যেই line পাচ্ছি সেটা convex, নাকি non-convex region এ নড়বে সেটা দেখতে হবে।

Lec-11

- A rectangular matrix has no inversion. এর কোন solution নাই।
- Standard LP problem সবসময় minimize করতে হয়।
- কোন variable (-ve) হলে একে

$$x_j = x_j' - x_j''$$ এই Form এ লিখব

- Convex set মানে enclosed set.