

Construction Management

Construction:

Q. Define Construction with its example.(2 marks)

- ❖ Building or assembling of infrastructure is known as Construction.

Eg:

- ✓ Residential Building are treated as light construction
- ✓ Airport Construction, Railway Construction are treated as heavy Construction
- ✓ Power Stations are treated as industrial construction

Q. Define Construction Management and explain briefly. (3 marks)

- ❖ Construction Management is the management of 6M:

- | | | |
|---------------|--------------|------------|
| (1) Money | (3) Machine | (5) Minute |
| (2) Materials | (4) Manpower | (6) Method |

(1) Money :

- Money is required for doing every construction work.
- Money is required for buying the different construction materials, for hiring or buying the equipments, for paying the remuneration of workers.

(2) Materials:

- The different types of Construction materials like cement, sand, aggregates, reinforcement rod, stones, bricks, water, etc are used for doing different types of construction works.

(3) Machine:

- Broadly, there are two types of machine:

(a) Tools :

- The machine which does not consumes fuels is known as tools. Example: Wheel Barrow, Trowel, Spade, Peak, etc

(b) Equipment:

- The machine which consumes fuel is known as equipment. Example: Excavator, Dozer, Crane, etc.

(4) Manpower :

- Broadly, there are three types of manpower

(a) Skilled Manpower: The manpower who have special skills for doing the work is known as skilled manpower.

(b) Un-skilled Manpower: The manpower who do not have special skills for doing the work is known as un-skilled manpower.

(c) Semi-skilled Manpower : The manpower who have skills less than skilled manpower and more than un-skilled manpower is known as semi-skilled manpower.

(5) Minute:

- For any construction work, time is required.
- The unit of time may be in minutes, hours, weeks, months, years, etc which depends upon the quantity of work.

(6) Method:

- There are basically two types of construction methods:

(a) Labor Intensive work:

- In labor Intensive work most of the works are done with the help of labour. Eg: Green Road Approach

(a) Equipment Intensive work:

- In equipment intensive works, most of the works are done with the help of equipment.

Q. Define Organization. What are the needs of Organization? (2+3)

- ❖ Organization is a group of people put together to get the things done in a systematic way.

Need for Organization:

- ❖ To arrange right people at right time at right place.
- ❖ For fulfillment of management's objectives
- ❖ For achievement of goal
- ❖ For prompt decision.

Principle of Organization

- ❖ Unity of Command
- ❖ Control

- ❖ Delegation of Authority
- ❖ Hierarchy
- ❖ Co-ordination
- ❖ Communication
- ❖ Span of Management

Q. Explain about the types of Organization? (5 marks)

(A) Line Organization:

- ❖ It is also called **military organization**
- ❖ It is simple and earliest one
- ❖ Authority flows directly from head of the organization to the bottom step by step.
- ❖ **Construction industry (Civil Engineering)** is a line organization.
- ❖ Line organization is suitable for **simple nature of work**.

(B) Line and Staff Organization:

- ❖ To solve the various operating problems, organizations is advised by the specialists.
- ❖ Suitable for **simple and complicated nature of work**.

(C) Functional Organization:

- ❖ Authority is given to staff in functional organization
- ❖ Functional organization is improved among above two.
- ❖ It was introduced by **Frederick W. Taylor** (F.W. Taylor)

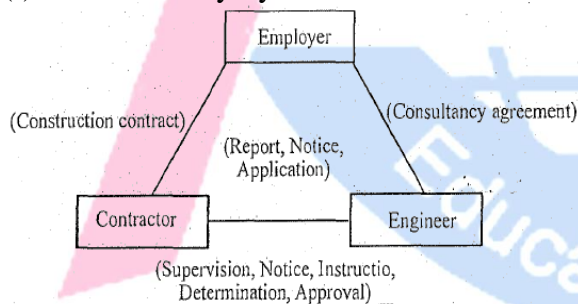
Q. What are the **responsibilities of Civil Sub-Engineer**? (5 marks)

- ❖ Civil Sub-Engineer acts as a bridge between Engineers and Labours
- ❖ In Construction work, Overseer plays the role of supervisor.
- ❖ To teach the sub-ordinates
- ❖ To maintain record of attendance of daily workers.
- ❖ To fill up the measurement book.
- ❖ To understand his/her own duty.
- ❖ To plan and execute the work at site.

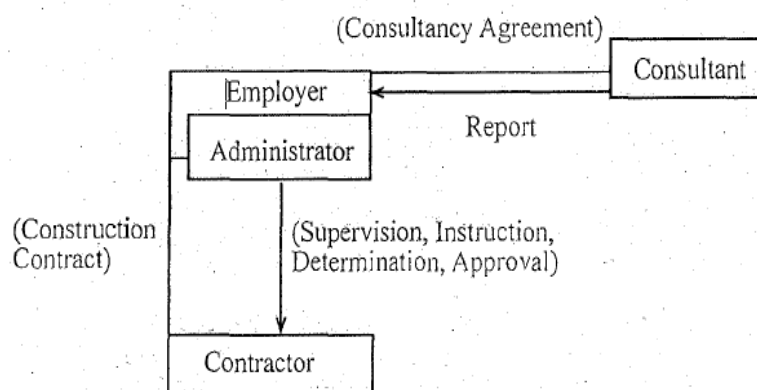
Q. Explain about the relation Between Client, Contractor and Consultant (3C's). (5 marks)

- ❖ Client means Owner or Occupier or Developer or Implementing agency or Employer
- ❖ Consultant means Engineer or Architect or Designer
- ❖ Contractor means Builder
- ❖ Client may be ministry, governmental department, Public corporation, Private limited, NGO, INGO, an individual, etc

(I) Three Party System:



(II) Two-Party System (Japanese System)



Xm Q(1) Construction team (Party) means:

- (a) Engineer (c) Contractor
- (b) Owner (d) All of Above

Xm Q(2) The owner gets the assurance of work progress and quality from:

- (a) Labours (c) Contractor
- (b) Supervisors (d) Engineer

Site Management:

(A) Preparation of Site Plan

- ❖ Preparation of site includes clearance of project area, construction of access road, labour quarter, store room, technical office, administrative office, etc

(B) Organizing Labour

Efficiency of labour depends upon:

- Skill - Wages -Reward
- Knowledge - Working Hours -Punishment
- Experience -Willingness to work

Accident Prevention:

Tool Box Talk:

- ❖ 10 to 15 minutes of short briefing about activities, location, safety, etc before starting of work

Xm Q(3) For a safe working environment in the working site, "Tool Box Talk" is conducted

- (a) During the work
- (b) During lunch hour
- (c) At the end of day's work
- (d) Before start of day's work

Xm (4) Who is responsible for accident occurring at site?

- (a) Consultant (c) Himself
- (b) Client (d) Contractor

Planning and Control:

- ❖ Plan is an image, map or vision deciding about future line of action.
- ❖ Project is defined as temporary endeavour under taken to create a new product or services.
- ❖ Building Construction = Permanent
- ❖ Building Construction Project = Temporary

(A) Construction Schedule:

Name of the Project:..... Year.....

Location.....

S.N.	Activities	Quantity	Unit	Total Time Required	Magh			
					W-I	W-II	W-III	W-IV
1	Earthwork	40	Cubic meter	4 weeks	20	10	5	5

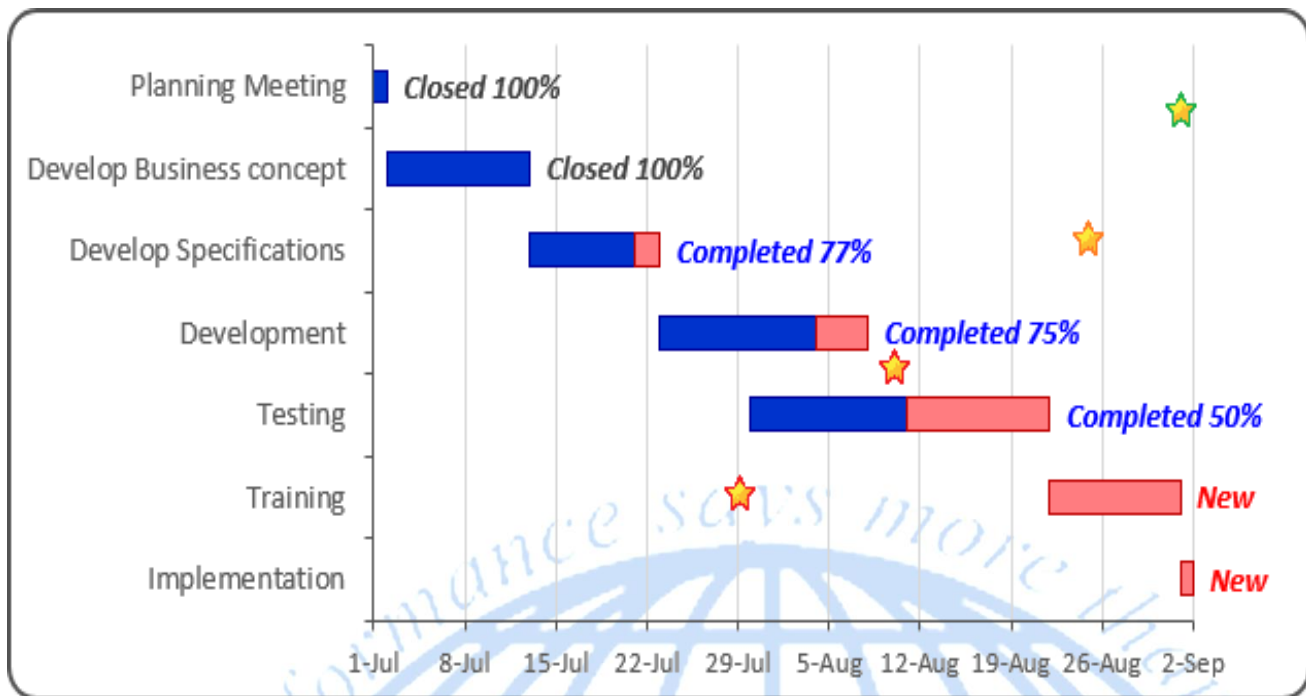
(B) Equipment Schedule

(C) Material Schedule

(D) Manpower Schedule

Q What are the **Scheduling Technique**? Discuss about any two of them. (3+7)

- (1) Bar chart
- (2) Milestone chart
- (3) Linked Bar chart
- (4) Network Technique:
 - (a) **Critical Path Method (CPM)**
 - (b) Program Evaluation and Review Technique(PERT)
- (1) Bar Chart:



- ❖ Bar Chart is also known as **Gantt Chart**
- ❖ Bar Chart was developed by Henry L. Gantt, an American Mechanical Engineer in **1900 A.D.**
- ❖ Bar chart is earliest method of project management.
- ❖ Bar chart is graphical representation of **time Vs Activity**
- ❖ The length of bar chart indicates the duration of the activity for its completion.
- ❖ Bar chart are suitable for **minor projects**.
- ❖ In Bar chart, activities are represented by horizontal line.

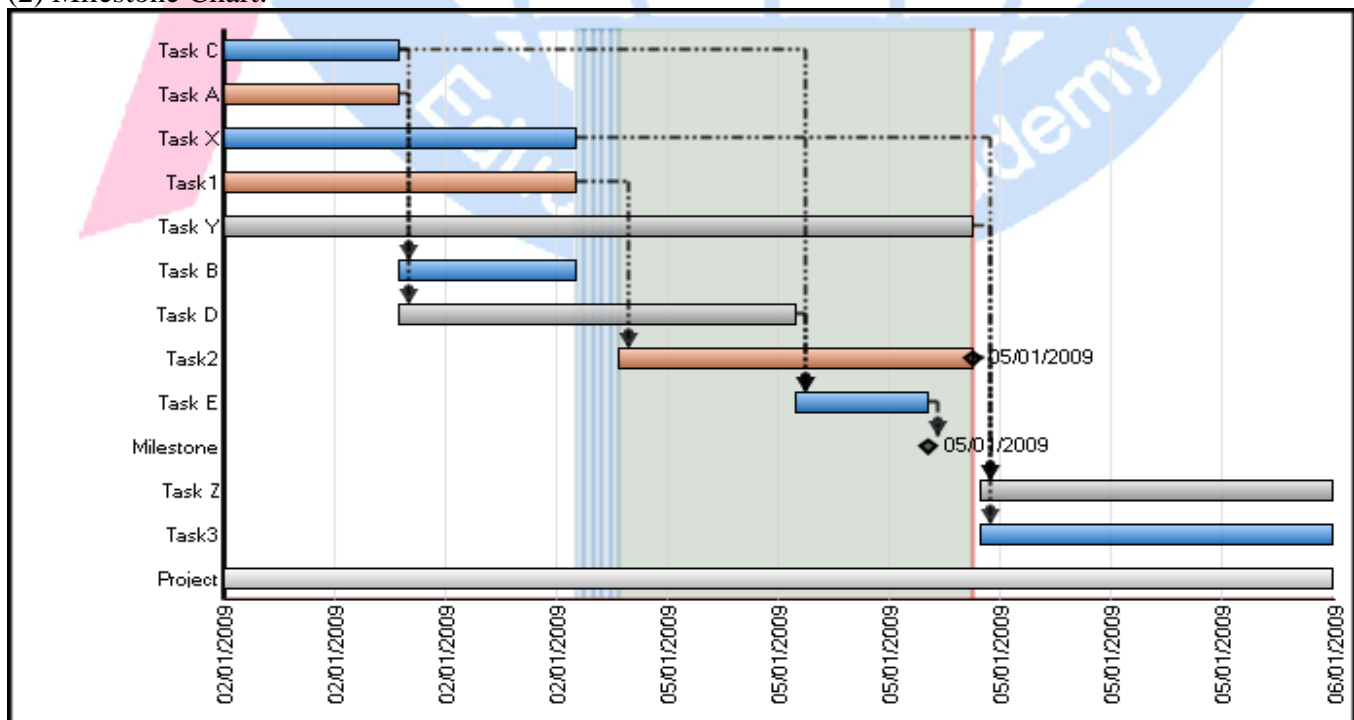
Advantages of Bar chart:

- ❖ Simple to understand
- ❖ Easy to prepare
- ❖ Consume less resources.

Dis-Advantages:

- ❖ Physical limit of size of the bar-chart
- ❖ Updating is required time and again
- ❖ Cannot distinguish between critical and non-critical activities.
- ❖ The length of bar chart may give false impression about the importance of the work.

(2) Milestone Chart:

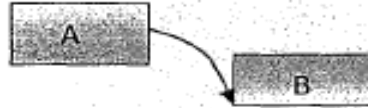


- ❖ Milestone chart is a modification of bar chart.
- ❖ It was developed in **1940 A.D.**
- ❖ Events are in chronological but not in logical sequence.
- ❖ The beginning and end of sub-divided activities are known as milestones.
- ❖ For a building construction, there are various activities but milestones may be considered as laying foundation stone, concreting, inauguration etc

(3) Linked Bar Chart

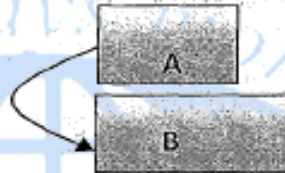
- ❖ Linked bar chart uses the links (arrow) to show the relationship between activities.
- ❖ There are mainly four types of relationship between activities.

1. Finish to Start



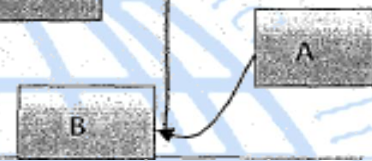
(Activity B cannot start until Activity A is finished)

2. Start to Start



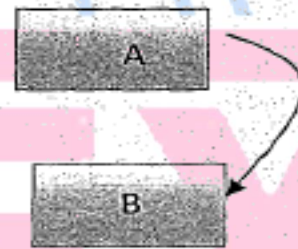
(Activity B must start when activity A starts)

3. Start to Finish



(Activity B should be finished when activity A starts)

Finish to Finish



(Activity B must be finished when activity A finishes)

Terminologies used in Network Technique:

(1) Activity (Task)

Q. Define Activity with its example. Explain the relationship between the activities. (2+3 marks)

- ❖ An activity is any identifiable job which requires time, manpower, material, and other resources to complete.
- ❖ **Arrow** in a network diagram represents activity.

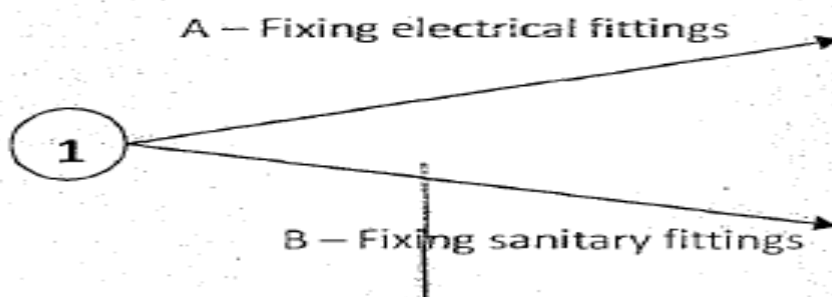
Examples:

1. Excavation of foundation
2. Construction of wall
3. Concreting
4. Wiring and electrification
5. Plastering and painting work

Relationship between activities:

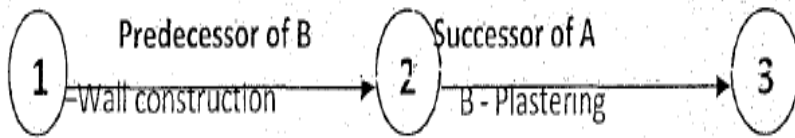
(A) Concurrent or Parallel Activities:

- Those activities which can be performed simultaneously and independently to each other are known as concurrent activities. In figure below activities A and B are parallel.



(B) Serial Activities:

- ❖ Those activities which are to be performed one after the other in succession are known as serial activities.
- ❖ Serial activities cannot be performed independently.



Activity Duration:

Q. Define activity duration. (2 marks)

- ❖ An activity's duration is the amount of time estimated for its completion.
- ❖ The time unit for the project can be minutes, hours, work days, calendar days, weeks or months.
- ❖ The use of the time units expressed should be consistent throughout the schedule.

Xm Q Activity duration depends upon:

- (a) Work Quantity
- (b) Nature of work
- (c) Method of Construction
- (d) All of Above

Event (Node)

Q. Define node. (2 marks)

- ❖ The beginning or end of the activity is known as Event.
- ❖ It represents specific point in time and does not consume time, manpower, material and other resources.
- ❖ Events are denoted by circle.

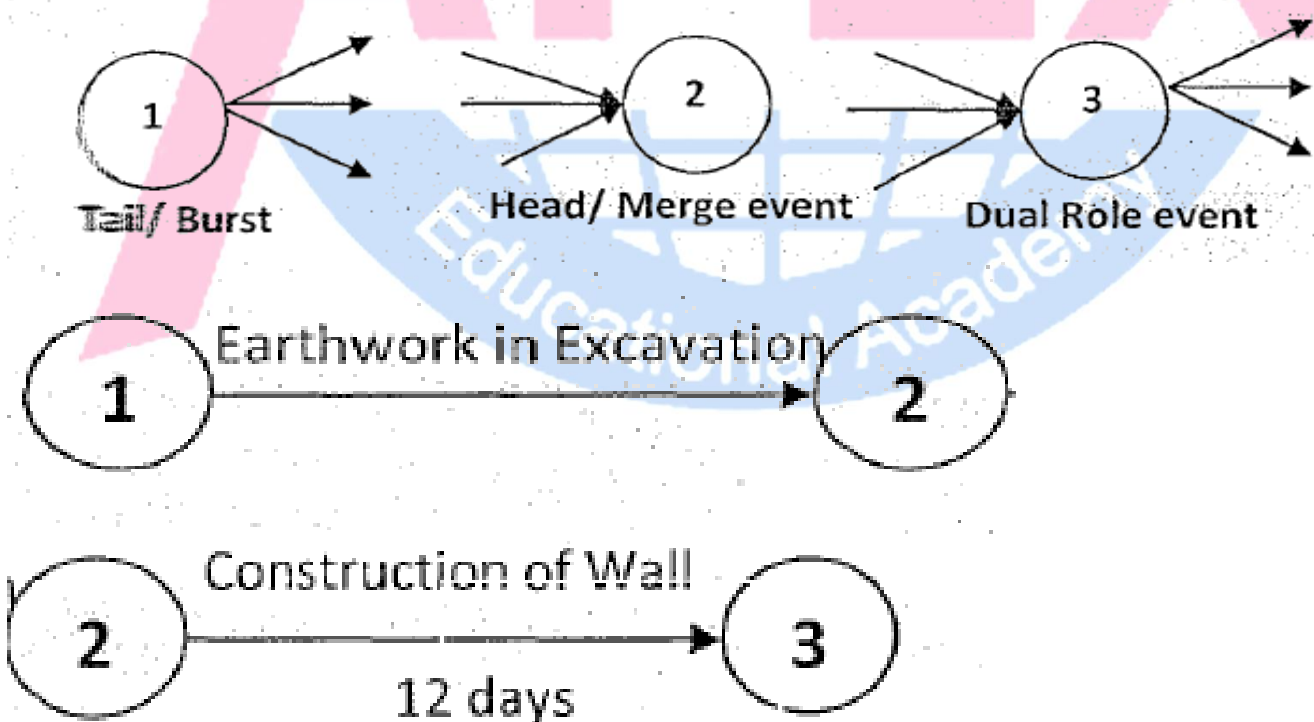
Xm Q Events are generally represented by:

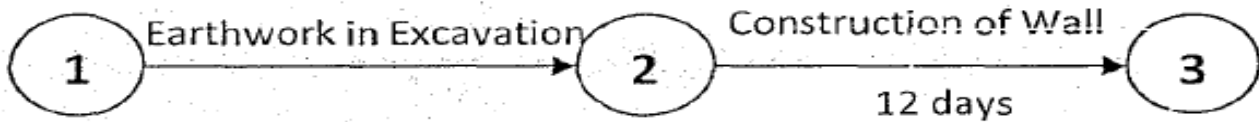
- (a) Square
- (b) Rectangle
- (c) Circle
- (d) Triangle

Xm Q Events are represented by:

- (a) Square
- (b) Rectangle
- (c) Circle
- (d) All of above

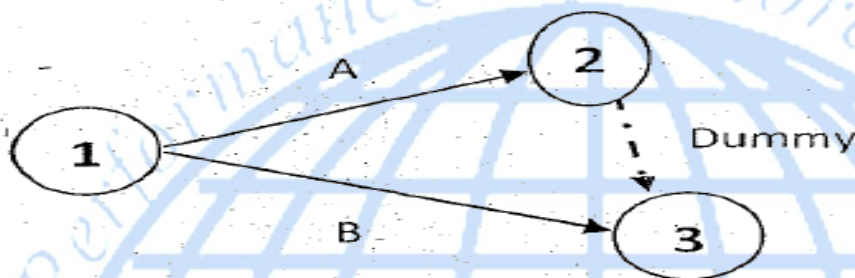
Tail Event, Head Event and Dual Role Event:





Q . Explain about the dummy activity. (5 marks)

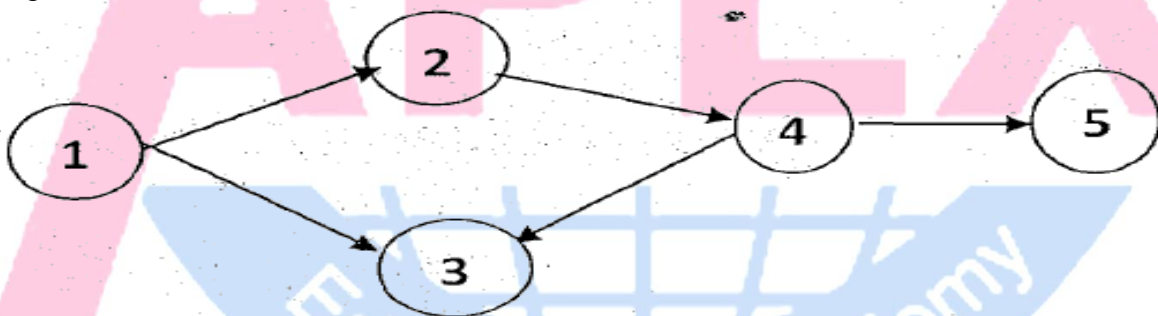
- ❖ Dummy activity is an imaginary (hypothetical) activity included in a network.
 - ❖ Since it is not a real activity, it does not consume time, money, manpower, material and other resources.
 - ❖ It is included in a network to maintain the relationship between activities .
 - ❖ It is represented by **dotted arrow**.
 - ❖ Dummy activity is also named as **redundant activity**.
 - ❖ Dummy serves two purposes in a network
- (1) Grammatical Purpose



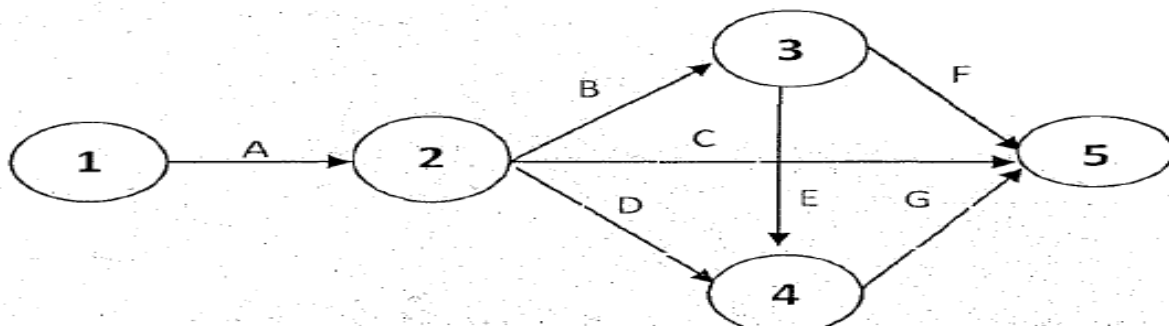
(2) Logical Purpose

Q. What are the rules of Drawing Network diagram? (5 marks)

- (1) Flow of network shall be from the left to the right.
- (2) There must be only **single initial node (tail event)** as well as **ending node (head event)** in a network.
- (3) There cannot be any network path looping back to previously occurred event. Thus network shown in figure below is incorrect.



(4) There shall not be any crisscrossing of arrows. Fig below shows a network in which two arrows cross each other which is incorrect.

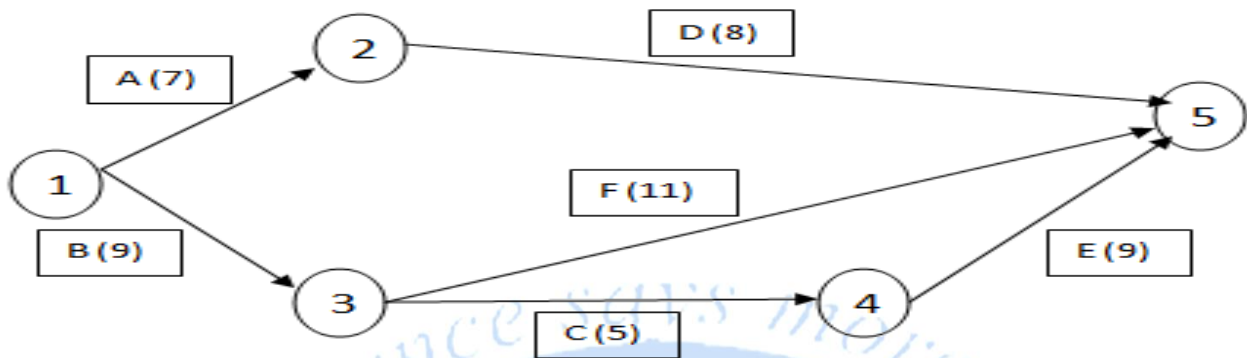


5) There should be only one arrow for an activity, i.e. number of arrows should be equal to number of activities.

Numbering the events:

Fulkerson's rule:

- (1) Top to down and left to right numbering
- (2) Always number the initial event as 1.



Activity Time

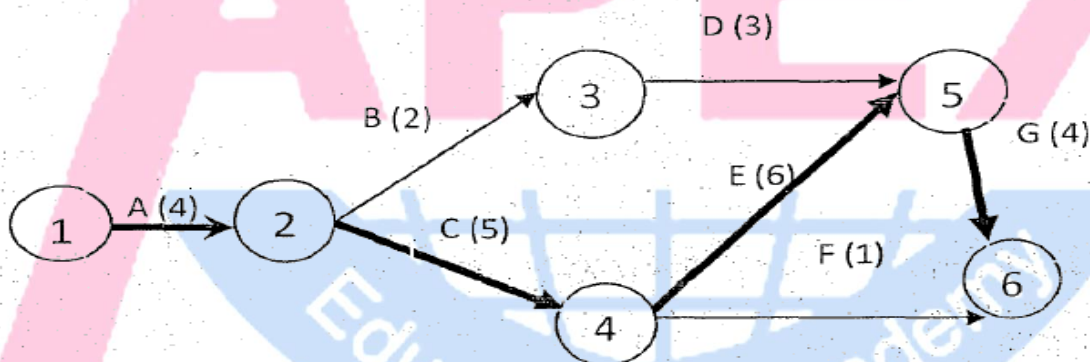
- (1) EST (Earliest Start Time)
- (2) EFT (Earliest Finish Time)
- (3) LST (Latest Start Time)
- (4) LFT (Latest Finish Time)

Critical Path Method / Critical Path Analysis:

Q. Define Critical Path (2 marks)

- ☐ The path that has the longest duration is called the critical path and the activities lying on the critical path are critical activities.
- ☐ It is the critical path that sets the overall duration of the project.
- ☐ CPM was developed by Morgan R Walker in **1957 AD.**
- ☐ It is such path of network which does not allow any delay (**Minimum Completion time**)

Critical Path Method / Critical Path Analysis:



Path	Description	Duration	Remarks
1	1 – 2 – 3 – 5 – 6	4+2+3+4 =13 days	
2	1 – 2 – 4 – 5 – 6	4+5+6+4 =19 days	Longest/Critical path
3	1 – 2 – 4 – 6	4+5+1 =10 days	

Thus Activities A, C, E and G are critical activities and Project duration is 19 days.

Q What are the characteristics of Critical Path? (5 marks)

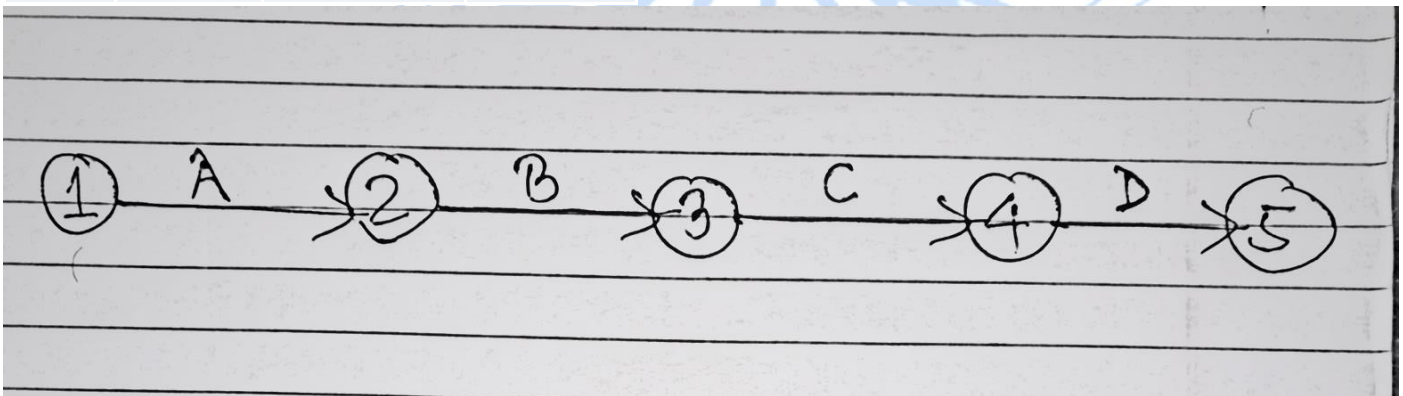
- ❖ Critical path is the **longest path (time wise)** connecting the initial and final events.
- ❖ Critical activity may run through dummy activity/activities also.

- ❖ The number of activities lying on critical path may be less than the number of activities in non - critical path.
- ❖ If two or more paths have the same time duration which is maximum, then all such paths will be critical paths.
- ❖ Critical path is also known as Chain path.
- ❖ The **total float along the critical path is 0.**

Numerical

Q(1) Draw a network with the following details. Number the events using Fulkerson's Rule.

S.No.	Activity	Predecessor	Successor
1	A	-	B
2	B	A	C
3	C	B	D
4	D	C	-



Finding Critical Path

Q. What are the methods of finding Critical path?(5 marks)

(A) **Forward pass computation**

- ❖ In the forward pass calculation, all activities in the network are assumed to start as early as possible.
- ❖ The calculation begins from the left to the right side of the network.
- ❖ When two or more activities merge into an event, the *largest value* is taken as an earliest occurrence time of that event.
- ❖ Forward pass calculation gives the EST and EFT of each activity.

(B) **Backward Pass Computation:**

- ❖ In the backward pass calculation, all activities in the network are assumed to start as late as possible.
- ❖ The calculation begins from the right to the left side of the network.
- ❖ When two or more activity merges at a node, the *smallest value* is taken as a latest occurrence time of that event.
- ❖ Backward pass calculation gives the LST and LFT of each activity.

Activity Float Analysis

Q Define Float. What are the types of float? (1+4)

Float (Slack):

- ❖ Float means the **available free time for an activity** (which is required for managers to manage the limited resources).
- ❖ It is the difference between the **time available to do a job and time required to do a job.**

Types of Float:

(1) Total Float (TF):

- ❖ It is the total free time for an activity i.e. maximum time by which completion of an activity can be delayed without affecting project completion time.
- ❖ $TF = LST - EST$ OR $TF = LFT - EFT$
- ❖ TF may be positive, zero and negative which represents sub-critical activity, critical activity and super-critical activity.

(2) Free Float (FF):

- ❖ It is the spare time allowable for an activity by which the completion of an activity can be delayed without affecting the start of succeeding activity.
- ❖ $FF = EFT - EST - \text{duration}$

(3) Independent Float (IF or Ind. F)

- ❖ It is the excess time available if the preceding activity ends as late as possible and the succeeding activity start as early as possible.
- ❖ It may be negative but should be taken as zero.
- ❖ $IF = EFT - LST - \text{duration}$

(4) Interfering Float (Inf. F) or Head Slack

- ❖ **It is the difference between the Total Float (TF) and Free Float (FF).**
- ❖ **Inf. F = TF - FF**

PERT -Program Evaluation and Review Technique

Q. Define PERT. What are the time estimates of PERT?

- ❖ PERT is used in the completely newly developed project such as Research and design, new industries product design.
- ❖ PERT system is preferred for those projects in which correct time determination for various activities cannot be made.
- ❖ PERT uses **three time estimates** for each activity with a view to overcome uncertainty in time estimates.

1) **Optimistic time estimate (to):**

- 2) It is the **shortest possible time** in which an activity can be completed under ideal conditions.
- 3) Till arriving at the optimistic time estimate, it is assumed that everything is **favorable** in completing the activity in the shortest possible time.

2) **Pessimistic time estimate (tp):**

- ❖ It is the **maximum possible time** it would take to complete an activity under worst conditions.
- ❖ In arriving at the pessimistic time, it is assumed that everything is **unfavorable** for completing the activity in time and every possible delay and difficult situation is encountered.

3) **Most likely time estimates (tm):**

- ❖ It lies between optimistic and pessimistic time estimates.
- ❖ It is the time in which an activity can be completed under normal conditions.
- ❖ In arriving at the most likely time, it is assumed that conditions are neither favorable nor unfavorable, but normal.

Expected time estimate (te):

- ❖ PERT assumes that the optimistic time (to) and the pessimistic time (tp) are equally likely to occur while the most likely time is four times more likely to occur than the others

$$t_e = \frac{t_o + 4t_m + t_p}{6}$$

Xm Q. If for the activity, optimistic time is one day, most likely time is 3 days and pessimistic time estimate is 11 days then the expected time is:

- (a) 3 days
- (b) 4 days
- (c) 5 days
- (d) 6 days

$$t_e = (1 + 4 \times 3 + 11) / 6$$

$$4 \text{ days}$$

- ❖ There are two measures of variability of possible activity times and they are:

- 1) Variance and
- 2) Standard deviation

- ❖ PERT uses the following simplified formula for arriving at the variance and standard deviation of activity times.

$$\text{Variance } (\sigma^2) = \left[\frac{t_p - t_0}{6} \right]^2 \text{ and Standard deviation } (\sigma) = \left[\frac{t_p - t_0}{6} \right]$$

Performance Control using Earned Value Analysis:

Q. Define Earned Value Analysis (EVA). What are the methods of analyzing the EVA methods? (1+4)

- EVA is an approach for measuring how much work has been completed in a project at a given point of time and performance.

EVA tools:

- 1) Actual Cost of Work Performed (ACWP)
 - 2) Budgeted Cost of Work Performed (BCWP)
 - 3) Budgeted Cost of Work Schedule (BCWS)
- ❖ **Cost Variance (CV) = BCWP-ACWP**
 - Negative no. indicates that project is over-budget.
 - Positive no. indicates that project is under-budget.
 - Zero indicates that project is right on budget
 - ❖ **Schedule Variance (SV) = BCWP-BCWS**
 - Negative no. indicates that project is behind schedule.
 - Positive no. indicates that project is ahead of schedule.
 - Zero indicates that project is right on schedule.
 - ❖ **Cost Performance Index (CPI) = BCWP/ACWP**
 - Values under 1 indicates that project is over-budget
 - Values over 1 indicates that project is under-budget.
 - Values equal to 1 indicates that project is right on budget.
 - ❖ **Schedule Performance Index (SPI) = BCWP/BCWS**
 - Values under 1 indicates that project is behind schedule.
 - Values over 1 indicates that project is ahead of schedule.
 - Values equal to 1 indicates that project is right on schedule.

Numerical:

Q. 50 units of plantation have to be done in two weeks period. Per unit cost of plantation is estimated as Rs. 200 of which progress monitoring was done 1 week after the work was started. Only 40 % of the work was found completed and the account record showed that the actual expenditure per unit was Rs 250. Calculate all the parameters of EVA.

Solutions:

- Budget on completion = 50×200
= Rs 10,000
- ACWP = 20×250 (40% of 50 = 20 units)
= Rs. 5000
- BCWP = 40 % of 10,000
= Rs. 4000
- BCWS:

In 2 weeks period, work of Rs. 10,000 can be done.

In 1 week period, work of Rs. 5000 can be done.

- $CV = BCWP - ACWP$
= Rs 4000 – Rs 5000
= -1000

This indicates that project is over-budget

- $SV = BCWP - BCWS$
= Rs 4000 – Rs 5000
= - 1000

This indicates that project is behind schedule.

- $CPI = BCWP / ACWP$

$$= 4000/5000$$

$$= 0.8$$

This indicates that project is over-budget.

$$\text{SPI} = \text{BCWP}/\text{BCWS}$$

$$= 4000/5000$$

$$= 0.8$$

This indicates that project is behind schedule.

Time Cost Trade-Off

Project Crashing:

Define Project Crashing (2 marks)

- ❖ Spending more money to get something done more quickly is called crashing.
- ❖ The main objective of project crashing is to reduce project duration.

Time cost tradeoff:

Terminologies used in crashing:

(a) Project cost:

The total sum of the project is the sum of two distinct costs:

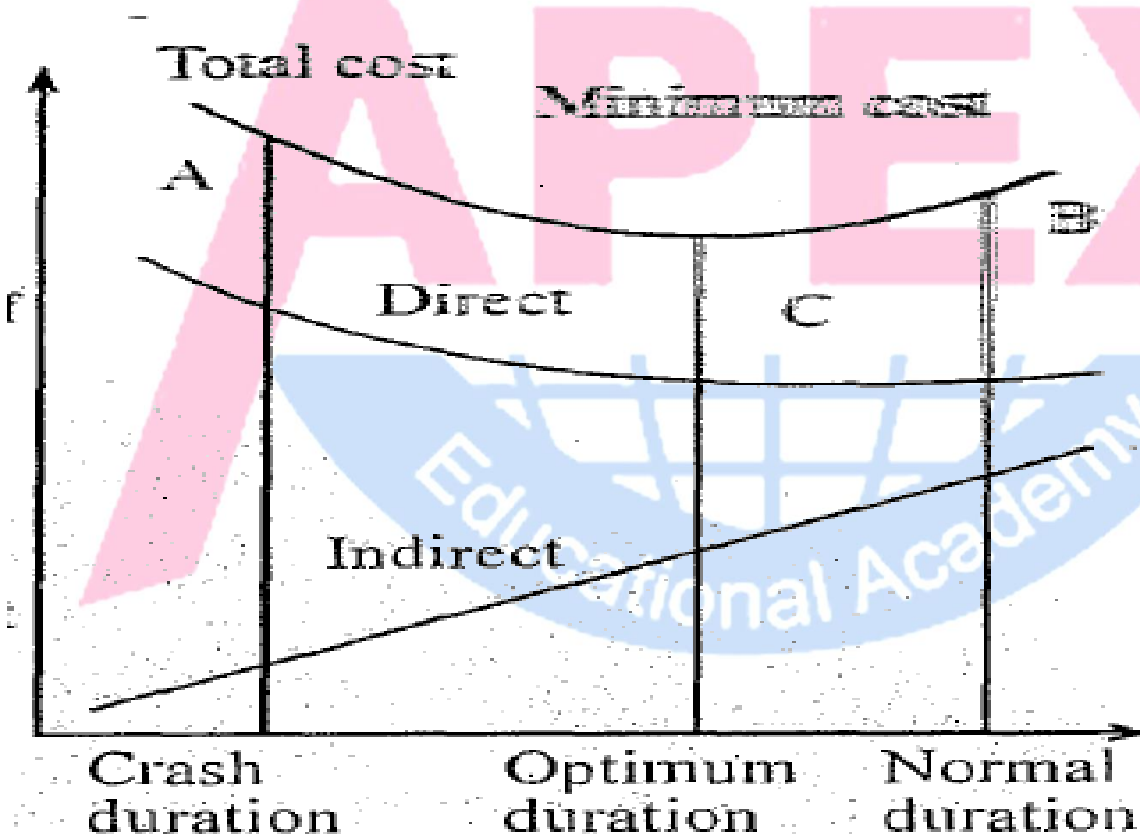
- (i) Direct cost
- (ii) Indirect cost

Direct cost:

- ❖ Money spent on materials, manpower and machines are direct cost.

Indirect cost:

- ❖ The expenditures which cannot be allotted clearly to the individual activities of the project, but are assessed as a whole are called indirect costs.
- ❖ The indirect cost includes overhead charges, administrative and establishment charges, supervision charges, and penalty etc.



Time-Cost trade-off:

- ❖ The judicious balance between time and cost is called Time-Cost trade-off.

Definitions of Terms

(a) Normal time

- ☐ The time usually allowed for an activity by the estimator is known as normal time.
- ☐ It is the standard time for that activity and is denoted by (T_n).

(b) Crash time

- ☐ The minimum possible time in which an activity can be completed by deploying extra resources is known as crash time.
- ☐ Beyond the crash time the duration of the activity cannot be reduced or shortened by any amount of increase in mobilization. It is denoted by (T_c).

(c) Normal cost :

- ☐ The direct cost required to complete the activity in the normal duration is called normal cost and is denoted by (C_n).

Crash cost

- ☐ The direct cost corresponding to the crash time of completing an activity is known as crash cost and is denoted by (C_c).

Cost slope:

- ❖ In crash time, direct cost is maximum and indirect cost is minimum.
- ❖ In normal time, direct cost is minimum and indirect cost is maximum.
- ❖ Optimum time is the time between crash time and normal time under which total cost of the project is minimum.
- ❖ The shape of total cost curve is like U.
- ❖ Reduction in project time increases the direct cost while decreases the indirect cost.

Contract:

According to Contract Act 2056 B.S. (2000 A.D.) : "Contract is an agreement between two or more than two parties to do or not to do something, which can be enforceable by law".

Elements of Contract:

- Offer and Acceptance
- Consideration
- Capacity to contract
- Lawful purpose
- Possibility of performance
- Free consent
- Certainty/ uncertainty
- Legal Relationship
- Written
- Two or more competent parties
- ☐ Q. "All contracts are agreements but all agreements are not contracts."

HINT: Agreement + legality = Contract

Contract as per enforceability

- 1) Valid Contract
- 2) Void Contract
- 3) Voidable Contract

Types of Contract:

(I) Classification by the method of payment for the Work:

- (a) Lump Sum or Stipulated Sum Contracts
- (b) Unit- Price or Schedule of Rates Contracts
- (c) Cost plus Contracts

Cost plus Contracts:

- (i) Cost + Percent of Cost
 - (i) Cost+ Fixed Fee
 - (ii) Cost+ Fixed Fee +Profit .Sharing
 - (iii) Cost+ Sliding Fee

Project Delivery Methods:

(i) *The Traditional Method- Design-Bid-Build*

- ☐ The design is complete before the tender stage (Price certainty)
- ☐ The designer understands how the construction will be Undertaken (build ability)
- ☐ The design does not change substantially during Construction (avoiding delay and disruption)

(ii) Owner-Builder

(iii) The Design-Build Method

Three types of design-build entities:

- (a) Contractor Led (subcontract design or Joint Venture (JV))
- (b) Designer Led (subcontract construction or joint venture)
- (c) A single firm with both capabilities internally
 - (iv) EPC (Engineering Procurement Construction)
- (v) Turn Key contract
- (vi) Build Own Operate Transfer (BOOT) Contract
- (vii) Construction Management Contracts

5.3 Tendering Process

Tender or bid:

- ☐ It is an offer in written by the tenderer (the person who offers the tender)
- ☐ In making procurement by bidding, an invitation to bid can be made by the following process:-
 - (a) Inviting open bids by determining prequalification.
 - (b) Inviting open bids without determining prequalification

Pre-Qualification:

- It is the process of short listing of eligible bidders and avoids crowding of bidders.

Bidding

- The process of offering a tender or bid to execute some specified work or to supply some specified goods at a certain rate/amount or to give service within a fixed time frame under certain conditions of agreement.
- It is a process of procurement.

Bidding Stages:

(i) Single stage Single-Envelope Bidding Procedure

- ☐ In the single-stage one-envelope bidding procedure, bidders submit bids in one envelope containing both the Financial Proposal and the Technical Proposal

(ii) Single stage Two-Envelope Bidding Procedure

- ☐ In the single-stage, two-envelope bidding procedure, bidders submit two sealed envelopes simultaneously, one containing the Technical Proposal and the other the Price Proposal, enclosed together in an outer single envelope.

(iii) Two-Stage Two-Envelope Bidding Procedure.

- ☐ In the two stage two envelope bidding procedure, at the first stage, Bidders submit two sealed envelopes simultaneously one containing the Technical Proposal and the other the Price Proposal, enclosed together.

Why Tendering?

- To select the best consultant
- To select the best contractor
 - To get quality work
 - To get work at competitive price
 - To maintain transparency
 - Public private partnership (encourage contracting procedure)

Preparation Before Tendering

- Project Preparation
- Estimating of Quantities
- Cost Estimate
- Approval of Estimate
- Resource Planning
- Tender Document Preparation

Tender Notice

- Tender Notice is the information inviting bids from competent and capable contractors and forms a part of contract document.
- It is published in the important newspaper.

Information in Tender Notice

- The name and address of the public entity inviting bids
- Nature of work and its location
- The place of delivery of the goods to be supplied, the services to be delivered and the construction work to be performed.
- The amount of bid security and validity period of the bid

- Date, time and place where and when the tender document is available
- Cost of tender document
- The place, manner, deadline for the submission of the bidding documents.
- Provision of e-bidding and its process
- The place, date and time for the opening of bids
- Expected date of acceptance of the successful bids, etc



Government of Nepal
Ministry of Urban Development
Department of Urban Development and Building Construction
Division Office Parsa

Invitation for Bids

Date of publication: 17 June, 2018 (3 Aashadh, 2075)

1. **The Department of Urban Development and Building Construction Division Office Parsa** invites electronic bids from eligible bidders for **following bids under National Competitive Bidding – Two Envelope Bidding procedures**. Only eligible bidders with the following key qualifications should participate in this bidding. The Bid validity period of all bids shall be 120 days from the date of last date of bid submission.

Sn	Contract Name and ID Number	Average Annual Construction Turnover of the best 3 years	Minimum Work experience of similar size and nature	Bid Security (NRs.)	Price of Bidding Document
1	Construction/Upgrading of Various Road Segment of Nijgadha Smart City (Phase-1), Bara, Contract Id No. DUDBC/ Parsa/2074-075-NCB-20	NRs. 159.74 Million	NRs. 170.39 Million	6,017,000.00	10,000.00
2	Construction/Upgrading of Paraswa-Paltu-wa-Khathbahiya Road, Gujara Municipality, Rautahat, Contract Id No. DUDBC/ Parsa/2074-075-NCB-21	NRs. 89.45 Million	NRs. 95.41 Million	3,369,000.00	10,000.00
3	Construction/Upgrading of Devahi to Khresahariya Road of Devahi Gonahi Municipality Rautahat, Contract Id No. DUDBC/Parsa/2074-075-NCB-22	NRs. 71.46 Million	NRs. 76.22 Million	2,692,000.00	10,000.00

2. Only electronics bidding through www.bolpatra.gov.np/egp is permitted and bid shall be submitted on or before 18th July, 2018 (2nd Sharawan, 2075) 12:00 PM and Technical Bid shall be opened on the same date at 12:00 PM. Eligible Bidders may obtain further information from **DUDBC Parsa** and Email: dudbcparsa@gmail.com or may visit PPMO website www.bolpatra.gov.np/egp.

3. Bidders should deposit cost of bidding document in DUDBC Parsa Division's Rajaswa (revenue) account as specified below or may deposit cash in DUDBC Office and the scanned copy (pdf format) of the Bank deposit voucher/ receipt shall be uploaded by the bidder at the time of electronic submission of the bids. Information to deposit the cost of bidding document in Bank:

Office Code : 34-347-01
 Revenue Account No. : Ka-11-001
 Revenue Head No. : 14227
 Name of Bank : Rastriya Banijya Bank, Aadarshanagar Birgunja
 Name of Office : DTCO, Birgunja

Division Chief

Tender Documents

- Bidding or tender document is a document prepared by the concerned firm making invitation to bids for submission by bidders by filling up the price or rate.
- It is prepared before publishing the tender notice.

It includes:

- Instruction to bidders
- Specifications
- Drawing
- Terms of Reference (TOR)
- Schedule of work
- Evaluation criteria
- Bill Of Quantities (BOQ)
- Conditions of Contract
- Warranty, Repair and maintenance.

Tender Evaluation

- It is the process of finding out the Lowest Evaluated Substantially Responsive Bidder.
- In evaluating and comparing a bid, comparison shall have to be made by fixing the quoted price excluding Value Added Tax.
- The tender is evaluated in accordance with the criteria and method set forth in bidding documents.
- While evaluating a bid, the technical and financial aspect is evaluated.

Terms

(1) Earnest Money/Bid Bond/Bid Security:

- ❖ It is the amount of money deposited while bidding a tender as a guarantee of the party's willingness of carried out the work award to him/her.
- ❖ Earnest money = (2-3)% of Estimated Amount

(2) Performance Bond/ Performance Security:

- ❖ It is the amount of money deposited by a successful bidder as a security for satisfactory performance.
- ❖ In Nepal, performance security = 5 % of Contract Amount.
- ❖ For foreign contractor, performance security = 10 % of Contract Amount.
- ❖ Performance bond is refunded after the Defect liability period (Maintenance period)

Note: If the contractor bids below than 15 %, additional half of the percentage more than 15 % should be deposited. i.e. $(0.85 \times \text{Estimated amount} - \text{Bid amount}) \times 0.5$

(3) Retention Money:

- ❖ The amount of money deducted from every running by the client is known as retention money.
- ❖ Retention Money = 5 % of running bill (Interim Payment Certificate, (IPC))

(4) Bid Validity Period:

- ❖ The duration of time that the amount of bid bond holds by the client is known as Bid validity period.
Bid Validity Period = 90 days (3 months) for a project upto 10 crore
Bid Validity Period = 120 days (4 months) for a project greater than 10 crore.

(5) Defect Liability Period (DLP):

- ❖ Defect Liability Period is also known as Maintenance period.
- ❖ The duration of the time that the contractor is liable of his/her done work is known as Defect Liability Period
Defect Liability Period = One (1) year after the completion of the project

(6) Liquidated Damage (LD):

- ❖ Liquidated Damage is also known as penalty.
- ❖ Liquidated Damage = 0.05 % of contract amount per day but not exceeding 10 % of contract amount.

(8) Contingency:

- ❖ The amount allocated for the unexpected cost in construction is known as Contingency.
- ❖ Contingency = About (3-5)% of estimated amount.

(9) e-GP:

- The Electronic Government Procurement (e-GP) system is the e-bidding system.
- Public Procurement Monitoring Office (PPMO) has established a centralized e-Government Procurement (e-GP) system for nation wide public procurement management.
- It includes registration of bidders, procurement planning, e-tendering, online evaluation, contract management, etc.

(10) Blacklisting:

- If a public entity requires blacklisting a bidder or other person firm or company, it shall have to request in writing with details of statement and causes along with documents to the PPMO under the office of Prime-minister and council of minister, GON

(11) Extension of Time (EOT)

- If the delay is not due to Contractor's fault, there is provision of EOT.
- Upto 6 months, EOT is approved by the person who has authority to approve bids.
- If EOT is more than 6 months, Department Head should approve it.

(12) Provisional Sum (PS)

- Generally provisional sum is an amount allocated for a specialized work by a specialized firm, for which the details are not available at the time of tender.

(13) Clean Bill of lading:

- A bill of lading issued by a carrier declaring that the goods have been received in an appropriate conditions, without the presence of defects
- It includes inspecting the packages for any damage, missing quantities or deviation in quality.

(14) Line of Credit (LC):

- A letter from a bank guaranteeing that a buyer's payment to a seller will be received on time and for correct amount.

- If the buyer is unable to make payment on the purchase, the bank will be required to cover the full or remaining amount of the purchase.
- A line of credit is basically a flexible loan from a bank or financial institution to an individual or business.

(15) Price Adjustment:

- The maximum amount of price adjustment to be made shall not generally be more than 25% of the initial contract prices for a project more than 12 months.
- Price adjustment clause applies to material, labor and fuel only.
- Adjustment Formula:

$$P_n = A + b \frac{L_n}{L_o} + c \frac{M_n}{M_o} + d \frac{E_n}{E_o}$$

Where,

P_n = Price adjustment factor

A = Constant, specified in the bidding forms

b, c, d = coefficient representing labor, materials, equipment usage

L_n, M_n, E_n = Current cost indices for month "n"

L_o, M_o, E_o = Base cost indices corresponding to the cost elements at the date specified (Generally, 28 days before the bid submission last date)

(15) Period of Re-bid notice:

- Re-bid notice period for NCB or PQ is 15 days and for ICB is 21 days.

(21) Rate Fixation Committee:

- Chief District Officer-Chairperson
- District Coordination Officer
- Chief, Treasury and Controller Officer
- One member of the District Coordination Committee
- Representative, Nepal Federation of Construction Entrepreneur
- Representative, Chamber of industry and commerce
- Technical Officer nominated by CDO

(22) Bid Evaluation Report:

- ❖ Bid Evaluation Committee shall prepare a bid evaluation report within 15 days of starting of bid evaluation.

Whom to Award the Contract:

- Lowest Evaluated Substantially Responsive Bidder

(23) Award of Contract:

- Within 7 days of the approval of the recommendations of the bid evaluation committee, the employer may issue the letter of intent to accept the lowest evaluated responsive bidder.

Define the term AET. (5 marks)

- ❖ AET stands for Administrative Approval, Economic approval and Technical Sanction.
- ❖ An approval of project made by the concerned department studying the preliminary report (based on preliminary design, drawing and estimates) submitted by the concerned technical division is known as administrative approval.
- ❖ Economic approval is done to find the status of the client to start the project.
- ❖ Project appraisal (Feasibility) parameters of economy are:
 - Payback period should be minimum.
 - Benefit cost ratio (B/C) > 1
 - Internal Rate of Return (IRR) $>$ Prevailing interest Rate.

Q. Define the term Muster roll (2 marks)

Answer:

- ❖ Muster roll is the attendance sheet of temporary workers for remuneration.
- ❖ Muster roll is used for keeping a complete record of attendance, payment made, unpaid wages and workdone by daily labor engaged on the execution of work.

Q. Define Measurement book. (2 marks)

- ❖ A measurement book is the original record of all kinds of work which are susceptible of measurement.

Q. Define Site order book. (2 marks)

- ❖ It is the book used to keep records of site order issued by site engineer.

Disputes

Q . What are the process to resolve disputes in Nepal? (5 marks)

Answer: The process to resolve disputes in Nepal are described below:

(1) Amicable settlement/ Negotiation:

- ❖ If a cause for a dispute arise between a contractor and a project owner , these party will attempt to reach a satisfactory resolution between themselves before going to other means.

(2) Mediation:

- ❖ Inclusion of a neutral third party in a dispute situation to help mediate the process of resolving the dispute.

(3) Adjudication:

- ❖ One single person is assigned as a adjudicator.
- ❖ In Nepal, there is a provision of adjudication for a contract value upto 10 crore rupees.

(4) Dispute Adjudication Board (DAB):

- ❖ It is also known as Dispute Board (D.B.) or Dispute Review Board (DRB)
- ❖ DAB composes of three independent and impartial persons selected by the contracting parties.
- ❖ As per PPA Nepal, there should be DAB for contract more than 10 crore rupees.
- ❖ Either party can submit a "Notice of Dis-satisfaction" within 28 days.

(5) Arbitration:

- ❖ Nepal Council of Arbitration "NEPCA" is a arbitration organization in Nepal.

Some terms:

(1) Resource Leveling:

- ❖ It mainly deals with demand and supply of resources.

(2) Resource Smoothing:

- ❖ It mainly deals with project duration time.

(3) Golden Rule of Procurement:

- ❖ Golden Rule of Procurement of construction work suggests that 67 % at the site and 33 % under procurement.

(4) Force Majeure

- ❖ Force Majeure means beyond the control
- ❖ This clause usually include act of god, act of man, act of parliament,etc
- ❖ It is also known as irresistible force.

(5) VAT:

- ❖ VAT stands for Value Added Tax
- ❖ As per Government of Nepal (GON), VAT = 13 %

Xm Q The amount of VAT for the purchase of steel having an amount of Rs 6000 should be:

- (a) Rs 300
- (b) Rs 600
- (c) Rs 780
- (d) Rs 960

Solution

$$\begin{aligned}\text{VAT} &= 13 \% \text{ of } 6000 \\ &= (13/100) * 6000 \\ &= \text{Rs } 780\end{aligned}$$

