

Subject: Estimating & Costing (17501)**Topic 1: Introduction****Contents:**

- Estimates- Meaning of the term estimating & costing, purpose of estimating & costing. Types of estimates and their purpose □ Approximate estimate- Plinth area rate method, Cubical content method, Service unit method, Typical bay method, Approx. quantity method.
- Problems on plinth area rate method and use of service unit method for selection of service units for different types of buildings. □ Detailed estimate- Detailed estimate, revised estimate, supplementary estimate, revised and supplementary estimate, repair and maintenance estimate and their uses in practical situation.

Que1 State the meaning of the term estimating and costing

Ans: Estimating: It the process of calculating the quantities and costs of the various items required in connection with the work for its satisfactory completion.

Costing: It the process of determining the actual cost of the work before the execution of work.

Que2 State any four purposes of estimating and costing.**Purpose of Estimating**

- Ans:**
- 1) To know the approximate cost of proposed work.
 - 2) To obtain administrative approval and technical sanction.
 - 3) To know the requirement of tools, plants and equipment.
 - 4) To fix up the completion period.
 - 5) To draw up a construction schedule and programme.
 - 6) To know value of property.
 - 7) To invite tender.
 - 8) To keep control over expenditure during construction.

Purpose of Costing

- 1) To arrange the finance for proposed work.
- 2) To know the probable cost of project before the execution.
- 3) For valuation of existing property
- 4) To know the cost of various items, well in advance, to be constructed.

Que3 State any four purposes of estimating and costing.

- Ans:**
- i) To know the approximate cost of proposed work.
 - ii) To obtain administrative approval and technical sanction.
 - iii) To know the requirements of tools, plants and equipments.
 - iv) To fix up the completion period.
 - v) To draw up a construction schedule and programme.
 - vi) To invite tenders.
 - vii) To keep control over expenditure during construction
 - viii) Valuation to know value of property

Que4 State different types of estimates and explain any one in detail.

Ans: There are two types of estimates:

1) Approximate estimate or preliminary estimate**2) Detailed estimate****1) Approximate estimate or preliminary estimate:**

This estimate is required for preliminary studies of various aspects of work or project, to decide the financial position and policy for administrative sanction by the competent authority. In case of commercial projects as irrigation projects, residential, building project and similar project which earn revenue, the probable income may be work out. To prepare the approximate estimate less skill and time is required.

2) Detailed estimate or item rate estimate:

Detailed estimate is an accurate estimate and consists of working out the quantities of each item of work. The dimensions, length, breadth and height of each item are taken out correctly from drawing and quantities of each item are calculate, and abstracting and billing are done. All other expenses required for satisfactory completion of project are added to the above cost to know the total cost of the detailed estimate.

Que5 What is revised and supplementary estimate?**Ans: Revised estimate:**

Revised estimate is a detailed estimate and is required to be prepared under any one of the following circumstances.

- i) When the original sanctioned estimate is likely to exceed by more than 5%.
- ii) When the expenditure on a work exceeds or likely to exceeds the amount of administrative sanctioned by more than 10%.
- iii) If there is change of rate or quantity of materials.
- iv) Major additions or alterations are introduced in original work.

Supplementary estimate:

It is detailed estimate of additional work and is prepared when additional works or changes are required to supplement the original works, during the execution of work. Then a fresh detailed estimate of additional works is prepared in addition to the original works.

The abstract should show the amount of the original estimate and the total amount including the Supplementary amount, for which sanctioned is required.

Que6 Differentiate with respect to four points' unit quantity method and total quantity method.**Ans:**

Sr.No	Unit quantity method	Total quantity method
1	In unit quantity method the work is divided into various items	In total quantity method item of work divided into the following five subdivisions a) Material, b) labour c) plant d) overheads e) profit
2	The total quantity of work under each item is taken out in proper unit of measurement.	The total quantity of each kind or class of material or labour are found and multiplied by their individual unit cost.

3	The total cost per unit quantity of each item is analyzed and work out	Similarly, the cost of plants, overhead expenses and profit are determined.
4	Then the total cost for the item is found by multiplying the cost per unit quantity by no. of units.	The cost of all the five sub-heads is summed up to give the estimated cost of the item of work

Que7 Describe 'typical bay' method for approximate estimate.

Ans: Typical Bay Method: This method is used for the buildings have similar column spans over a larger area such as factory buildings, go-downs, railway platform. Cost of each bay is found out by using other method of estimation. Then the cost of whole factory building is worked out by multiplying the total number of bays by the cost of construction for each bay.

Approximate cost = no. of bays X cost of one bay

Topic 2: Mode of measurement and brief specifications**Contents:**

- Units of measurement and desired accuracy as per IS: 1200, Rules of deduction for openings as per IS:1200 for brick work, plastering and pointing.
- Sequence of execution and brief description / specification of items of work as per PWD/GOVT. DSR, Standard formats of measurement sheet, Abstract sheet, face sheet.

Que1 State the mode of measurements for following items of work.

Ans: I) Honey combed brickwork : sq. m

II) Collapsible gate (steel) : sq. m

III) Form work : sq. m

IV) Brickwork(10 cm thick) in partition wall : sq. m

V) Dado : sq. m

VI) Wood work for door frame : cu. m

Que2 State the desired accuracy in taking measurements of items of work as per IS-1200

Ans: To achieve the desired accuracy in measurements, following points shall be observed,

1. Dimensions shall be measured to the nearest 0.01 m except the following:
 - Thickness of slab measured nearest to 0.005 m.
 - Wood work to nearest 0.002m.
 - Reinforcement to nearest 0.005 m.
 - Thickness of roadwork less than 20 cm, measured nearest to 0.005m.
2. Areas shall be measured to the nearest 0.01sq.m.
3. Cubic content shall be worked out nearest to 0.01cu.m. Wood work shall be measured nearest to 0.001cu.m.
4. Weights shall be workout to nearest 1 kg.

Que3 State the rules for deduction in plastering as per IS - 1200.

Ans: Plastering usually 12mm thick is calculated in sq.m.

Deduction in plastering are made in the following manner

- 1) No deduction is made for ends of beams, posts, rafters etc.
- 2) No deduction is made for opening up to 0.5 sq.m. And no addition is made for jambs, soffits and sill of these opening.
- 3) For opening more than 0.5 sq.m. And up to 3 sq.m. Deduction is made for one face only. No addition for jambs, soffits and sills.
- 4) For opening above 3 sq.m. Deduction is made for both faces of openings, and the jambs, soffits and sill shall be added.

Que4 State the rules for deduction for openings as per IS-1200 for brickwork and plastering.

Ans: Rules for deduction for openings as per IS-1200 for brickwork :

No deduction is made for the following :

- i) Opening upto 0.1 sq. m
- ii) Ends of beam, posts, rafters, purlin etc. chajjas where thickness does not exceeds 10 cm.
- iii) Bed plates, wall plates, bearing of chajjas where thickness does not exceed 10 cm.
- iv) Bearing of floor and roof slabs are not deducted from masonry in superstructure.

Que5 State Rules for deduction for openings as per IS-1200 for plastering :

Ans: Rules for deduction for openings as per IS-1200 for plastering :

Deduction in plastering are made in the following manner :

- i) No deduction is made for ends of beams, posts, rafters, purlin etc.
- ii) No deduction is made for opening upto 0.5 sq. m. and no addition is made for jambs, soffits, and sills of these openings.

iii) For opening more than 0.5 sq. m. and upto 3 sq. m. deduction is made for one face only. No addition for jambs, soffits, and sills of these openings.

iv) For opening above 3 sq. m. deduction is made for both faces of openings and the jambs, soffits, and sills of shall be added.

Que6 Draw the standard formats of measurement sheet, abstract sheet and face sheet.

Ans:

i) Measurement sheet :

Item number	Description or particulars of items	Number	Length In m	Breadth In m	Height or depth In m	Quantity	Total quantity
1	2	3	4	5	6	7	8

ii) Abstract sheet :

Sr. No.	Quantity	Description or particulars of items	Unit	Rate Rs. P.	Unit of rate	Amount Rs. P.
1	2	3	4	5	6	7

iii) Face sheet:

Sr. No.	Particulars	Amount
01	Estimated cost	Rs.....
02	Water supply and sanitary charges @... %	Rs.....
03	Electrification charges@...%	Rs.....
04	Contingencies@... (3 to 5 %)	Rs.....
05	Work charge establishment @ (1 to 2 %)	Rs.....
	Total Amount	
	In words	

Topic 3: Preparation of estimate

Contents:

3.1 Approximate Estimate (16 Marks)

- Plinth area/carpet area/Super built up area of building by using PWD rates and local rates
- Estimates of roads, highway, railways, bridges/culverts, irrigation projects and water supply projects.

3.2 Detailed Estimate (12 Marks)

- Data required for detailed estimate
- Steps in preparation of detailed estimate
- Preparing check list of RCC framed structure building/roads, listing of approximate % of steel required for various RCC members.
- Methods for taking out quantities by Long wall and Short wall method, Centre line method.
- Taking out quantities of various items of building (RCC framed structure and Load bearing structure), road work as per PWD method.

3.3 (12 Marks)

- Bar bending schedule and steel quantities calculation for footing, column, beam, slab and chajja.
- Earthwork computation-Meaning and methods, calculation of earthwork quantity for roads and canal by average cross sectional area method, mid sectional method, Prismoidal formula method.
- Provisions to be made in detailed estimate for contingencies, work charged establishment, centage charges, water supply and sanitary arrangements, internal electrification etc.
- Meaning of the terms- Prime cost, Provisional sum, provisional quantities, Day work

Que1 Explain plinth area rate method of approximate estimate

Ans: This estimate is prepared on the basis of plinth area of building. The rates are obtained from a similar building having similar specification, heights and construction in the locality. Plinth area estimate is calculated by finding the plinth area of the building and multiply by the plinth area rate.

i.e. Approximate cost = Plinth area x Plinth area rate

The plinth area should be calculated for the covered area by taking external dimensions of the building at the floor level. Courtyard and other open area should not be included in the plinth area.

Que2 How will you prepare approximate estimate for roads and highways

Ans: Approximate estimate for roads and highways is prepared for per kilometer basis depending on the nature of road, width and thickness of metal etc. for roads and highways the factors to be considered area, land to be acquired, quantity of earthwork, type of road etc.

1. The cost of land acquired: The cost is variable if the route is passing through highly developed area, the cost of this item will be very high
2. The cost of excavation, embankment and drainage: The cost of this item depends on the topography of the country through which the highway runs.
3. The cost of road surface or pavement: the cost of this item is fairly constant for two different highways with same road surface.

e.g. for 10 km of a state highway approximate cost @ Rs. 500000 per 1 km works out as Rs.50 lakhs.

Que3 Describe 'provisional quantities' and 'provisional sum'

Ans: Provisional Sum:

Certain amount provided by experience estimators in the estimated cost of the project for some special type of work whose details are not known at the time of preparing estimate called "provisional sum". Some special works are listed below.

Shifting of water lines, Installation of air conditioner and its fittings, sewer lines such a work are done through licensed contractor or through respective department.

Provisional quantities:

These are the additional quantities which are not included in estimate. It occurs due to variation of site condition. These quantities are work out separately from the dimension of drawing and kept in the bill of quantities under a heading "provisional quantities".

When there is a possibility of certain concrete piles required to be lengthened in position, provisional quantities for the work shall be provided separately for the additional quantities.

Que4 Prepare approximate estimate of a public building having plinth area equal to 1800 sq. m.

- i) Plinth area rate as Rs. 3,500 / sq. m.
- ii) Special architectural treatment = 3% of cost of building.
- iii) Water supply and sanitary installation = 5% of cost of building.
- iv) Electric installation = 14% of cost of building.
- v) Other services = 5% of cost of building.
- vi) Contingencies = 3% of overall cost of building.
- vii) Supervision charges = 8% of overall cost of building.

Ans:

i) Cost of construction : P x Plinth area rate

$$= 1800 \times 3,500 = \text{Rs. } 6,300,000$$

ii) Special architectural treatment = 3% of cost of building

$$= \frac{3}{100} (6,300,000) = 189,000$$

iii) Water supply and sanitary installation = 5% of cost of building

$$= \frac{5}{100} (6,300,000) = 315,000$$

iv) Electric installation = 14% of cost of building

$$= \frac{14}{100} (6,300,000) = 882,000$$

v) Other services = 5% of cost of building

$$= \frac{5}{100} (6,300,000) = 315,000$$

$$\begin{aligned} \text{Overall cost of building} &= 6,300,000 + 189,000 + 315,000 + 882,000 \\ &+ 315,000 = 8,001,000 \end{aligned}$$

Add Contingencies = 3% of overall cost of building

$$= \frac{3}{100} (8,001,000) = 240,030$$

Add Supervision charges = 8% of overall cost of building

$$= \frac{8}{100} (8,001,000) = 640,080$$

$$\text{Grand Total} = 8,001,000 + 2,40,030 + 6,40,080$$

$$= \text{Rs. } 8,881,110$$

Que5 Explain PWD method of taking out quantities

Ans: PWD method is also called as Long wall and short wall or „out-to-out“ and „in-to-in“ method. For the accurate estimate the dimensions, length, breadth and height or depth are taken out correctly from drawings. Then the following steps are followed :

- 1) Draw the center line plan.
 - 2) Consider wall spanning in horizontal direction as „long wall“ and vertical direction as „short wall“ in plan or vice versa.
 - 3) Calculate the center to center lengths of long wall and short wall
 - 4) Calculate length of „long wall“ out to out
Length of long wall = c/c length of long wall + width of item
 - 5) Calculate length of „short wall“ in to in
Length of short wall = c/c length of short wall - width of item
 - 6) Multiply the length by the width and depth to find the quantity.
- Student should draw a diagram showing long wall and short wall or at least show sample calculation of long wall and short wall.

Que6 State the data required for preparing detailed estimate.

Ans: i) **Drawing:** The drawing is the basis from which quantities of various items for a work are calculated.

ii) Specification:

a) General specification: In general specification the nature and class of work and the names of material to be used are described. It gives a general idea for the project.

b) Detailed specification: Detailed specification gives detailed description of every item to be executed, with the qualities, quantities, proportion of materials, workmanship, the method of preparation and execution.

iii) **Rates:** The rates of various materials used in the construction & wages of different categories of labour should be available for preparing estimate.

- iv) The location of work and its distance from the source of materials and the cost of transport should be known.
- v) These rates may be obtained from P.W.D. schedule of rates book or the rates may be worked out the "Analysis of Rate" method.
- vi) **Modes of measurement:** Measurement for different items of work are different. These consider as per guideline of IS1200.

Que7 State the steps in preparation of detailed estimate

- Ans:**
- a) **Taking out quantities:** Divide the whole work into different items of works such as earthwork, concrete, brickwork etc. take the details of measurement of each items of work and enter the measurement of each item of work in measurement sheet. Once the measurement of each item of work is entered in measurement sheet, squaring of dimension is done.
 - b) **Squaring:** Squaring is the calculation of numbers, length, area and volume and are entered in the last two column of measurement sheet.
 - c) **Abstracting:** The cost of each item of work is calculated at the workable rates. The total cost is worked out and entered in the abstract of estimate form. A 3% to 5% is added for contingencies to allow for unforeseen expenses during the execution of work. A 1½% to 2% is added for work-charged establishment. The grand total thus obtained is the estimated cost of the project.

Que8 Explain Centre Line Method of Calculation of Earthwork.

- Ans:**
1. In centre line method sum of total length of centre line of walls, long wall and short walls has to be found out.
 2. In this method the Total Centre line length is calculated by subtracting the Centre line length by $\frac{1}{2} \times$ number of junction(Tee junctions or Cross Junctions \times Width of required Item.
 3. Total Centre Line Length = (Centre Line Length – $\frac{1}{2} \times$ Number of Junction \times One Width of that Item)

4. This method is quick but required special attention at junction, meeting points of partition or cross walls.
5. For rectangular, circular, polygonal building having no cross walls, this method is simple.
6. For building having cross or partition walls for every junction or partition or cross walls with main wall special consideration shall have to be made to calculate the correct quantity.

Que9 Explain various items of work for construction of R.C.C. Slab culvert.

Ans: Items of Work for Construction of R.C.C Slab Culvert: -

1. Earthwork Excavation for foundation (For Abutments and for Wing Walls)
2. Cement Concrete in foundation with stone ballast.
3. 1st Class Brickwork in Cement Mortar for Abutments./ P.C.C for Abutments
4. R.C.C work for Slab
5. Cement Concrete Wearing Coat
6. Cement pointing in walls
7. Steel Bar Bending in R.C.C work
8. Construction for Wing Wall
9. Construction for Parapet Wall

Que10 Explain how you will prepare approximate estimate of an auditorium.

Ans: Auditorium is designed to accommodate large audience.

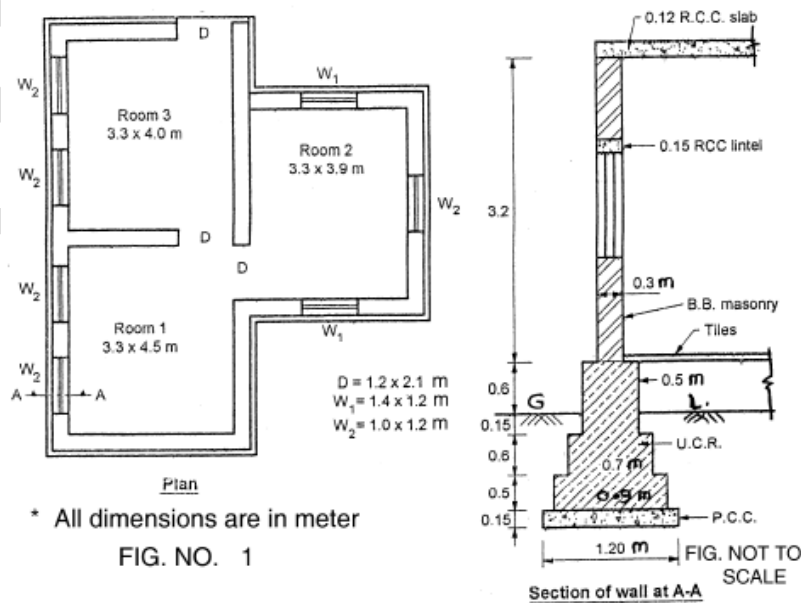
- As such they lead to have wide span and multiple stories high in order to accommodate seating and acoustical requirements.
- Raised stage floors, special lightening equipments are often required as well.
- Typical features of auditoriums required for approximate estimate are as follows:-

a) **Sloped Floors:** - Sloped floor, with leveled terrace for each row of seating help provide proper sightline from audience to stage.

- b) **Fixed Seats:-** Fixed seats are provided along with some space between two rows.
- c) **Special Lightening System:-** Lightening system should be flexible to accommodate various performance venues.
- d) **Fire & Life Safety:-** Fire and life safety is calculated in approximate estimate as additional cost may incurred for these safety features.

Que11 Work out quantities of following any three items of work and enter the same in standard format of measurement sheet with brief description of item. Refer Fig. No. 1

- i) Excavation for foundation.
- ii) U.C.R. masonry in foundation and plinth in c.m. (1 : 6)
- iii) B.B. Masonry in superstructure in c.m. (1 : 6).
- iv) Mosaic tile flooring.



* All dimensions are in meter
FIG. NO. 1

Sr. number	Quantity	Description or particulars of items	Unit	Rate Rs. P.	Unit of rate	Amount Rs. P.
1	2	3	4	5	6	7

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