

## **UNIT- I**

### **EASTIMATE OF BUILDINGS**

#### **1. What are methods to be adopted for volume calculating?**

- From cross-section
- From spot level
- From contours

#### **2. Define analysis of rates**

Determination of rates of works from the qualities and cost of materials and labour required is termed as analysis of rates.

#### **3. Define a tender**

Tender is an offer given in writing to execute specified articles or materials at a certain rate, within a fixed time, under certain conditions of agreement between the contractor and the party, which may be a government department or an individual.

#### **4. Define ‘contract’**

Contract is merely an agreement being enforceable by law between two persons or parties.

#### **5. What are the types of culvert?**

- i) Arch culvert   ii) Slab culvert   iii) Pipe culvert   iv) Box culvert

#### **6. What are the methods of estimate?**

Detailed estimate                      Abstract estimate

#### **7. What are the types of estimate?**

- i) Preliminary Estimate or Rough cost estimate                      ii) Plinth area estimate  
iii) Cube Rate Estimate or Cubical Content Estimate                      iii) Revised Estimate  
iv) Approximate Quantity Method Estimate                      v)Supplementary Estimate  
vi) Detailed Estimate or Item Rate Estimate  
vii)Supplementary Estimate and Revised Estimate  
viii)Annual Repair or Maintenances Estimate

## 8. Briefly explain about preliminary Estimate

The estimate which prepared using any rough method to get the approximate cost construction anticipated in a project is called an approximate or rough estimate. Since this estimate is normally prepared in the preliminary estimate.

**9. Estimate the quantities of brickwork and plastering required in a wall 4m long. 3m high and 30cm brick Calculate also the cost if the rate of brickwork is Rs.32.00 per cu.m. and of plastering is Rs.8.50 per sq.m.**

Qualities of brickwork	=	$L \times B \times H$
	=	$4\text{m} \times 3\text{m} \times 0.30\text{ m}$
	=	$3.6\text{ cu.m}$
Quantity of plastering (two faces)	=	$2 \times 4\text{m} \times 3\text{m}$
	=	$24\text{ sq.m}$
Cost of brickwork	=	$3.6 \times 320.00$
	=	$\text{Rs.}1,152.00$
Cost of plastering	=	$24 \times 8.50$
	=	$\text{Rs.}204.00$
Total Cost	=	$1,152.00 + 204.00$
	=	$\text{Rs.}1,356.000$

## 10. Define detailed estimate

The estimate, which provides the item wise quantities of works, item wise unit rates and item wise expenditure anticipated in the project / construction, is called a detailed estimate.

## 11. Define Abstract estimate

This is the third and final stage in a detailed estimate. The quantities and rates of each item of work, arrived in the first two stages, are now entered in an abstract form. The total cost of each item of work is now calculated by multiplying the quantities and respective rates.

## **12. Define quantity surveyor**

A qualified or experienced person who does the above mentioned works (taking off, squaring, abstracting and billing) is called a quality surveyor.

## **13. Write the duties of quality surveyor.**

- Preparing bill of quantities (Taking off, squaring, Abstracting and billing)
- Preparing bills for part payments at intervals during the execution of work.
- Preparing bill of adjustment in the case of variations ordered during the execution of work.
- Giving legal advice in case of court proceedings.

## **14. Write the essential qualities of a good surveyor.**

- The quality surveyor must be well versed with the drawings of work.
- He should be able to read the drawing correctly and bill the quantities accurately.
- He should have a thorough knowledge of the construction procedure to be adopted, the various items of works involved in the execution: and the different materials to be used in the work.
- He should be able to prepare schedule to be priced by tenderor.

## **15. What are the main components of culvert?**

Abutments                      Wing walls                      Arch

## **16. What are factors to be considered in design of septic tank?**

The following factors should be taken into consideration:

- Material should be water proof and corrosion resistant.
- Natural ventilation provided should be adequate.
- A manhole should be provided to permit inspection and cleaning.
- Baffles should be limited to one at the inlet and one at the outlet.
- The escape of gas and sludge to effluent pipe should be avoided.

### 17. Define Lead

Lead is the crow flying horizontal distance from the center of borrow pit to the center of the earthwork at site, i.e. center of the area of excavation to the center of placed earth.

### 18. Define lift

Lift is the distance through which the excavated soil is lifted beyond a certain specified depth.

**19. The actual expenditure incurred in the construction of a school building which have a total length of main wall 140 m is Rs.4.97 lakhs. Estimate the approximate cost of a similar school building which will have 180 m length of main walls.**

Total expenditure = Rs.4,97,000

Total length of main walls = 140 m

Rate per m length of main wall =  $4,96,000/140 = \text{Rs.}3,550/-$

Length of main walls in the proposed building = 180 m

Approximate cost =  $180 \times 3,550 = \text{Rs.}6,39,000/-$

### 20. Write the formula for Mid ordinate rule and Prismoidal formula Rule.

Mid sectional area method:

$$Q = (Bd_m + sd_m^2) \times L$$

Where, B – Formation width                      S – Side slopes                       $d_m$  – Mean depth

L – Length of the section

Prismoidal formula rule

$$Q = L/6 (A_1 + A_2 + 4A_m)$$

$$A_1 = Bd_1 + sd_1^2$$

$$A_2 = Bd_2 + Sd_2^2$$

$$A_m = Bd_m + sd_m^2$$

$$d_m = (d_1 + d_2) / 2$$

## **UNIT-II**

### **ESTIMATE OF OTHER STRUCTURES**

#### **1. Define estimate**

An estimate is a computation or calculation of the quantities required and expenditure likely to be incurred in the construction of a work. The estimate is the probable cost of a work and is determined theoretically by mathematical calculation based on the plans and drawing and current rates.

#### **2. Write the recommendation for degree of accuracy in measurements**

- Dimensions of works shall be measured to an accuracy of 0.01 m.
- Thickness of R.C. works shall be measured to an accuracy of 0.0005 m.
- Areas of works shall be calculated to the nearest  $0.01 \text{ m}^2$ .
- Volumes of work shall be calculated to the nearest  $0.01 \text{ m}^3$ .
- Volumes of wood shall be calculated to the nearest  $0.001 \text{ m}^3$ .

#### **3. Briefly explain about revised estimate**

The estimate, which is prepared When any major change or alteration is made in the plan / structural arrangement, with or without affecting the estimate cost, and When the estimated cost is likely to exceed by more than 5% during execution, due to increase in the cost of materials and labour or due to increase in the cost of materials and labour or due to alterations in the items of works to get the revised quantities / rates / amount is called a revised estimate.

#### **4. Calculate the quality of brickwork in an arch over a 1.80 m span opening.**

**The arch is 40 cm. thick and the breath of a wall is 40 cm.**

Radius of the arch = 1.8 m Thickness of arch = 40 cm

The breath of wall = 40 cm Mean die =  $3.60 + 0.40 = 4 \text{ m}$

Mean Length of the arch given =  $\frac{1}{6} * (\frac{22}{7}) * 4 = 2.1 \text{ m}$

Quantity of brickwork =  $2.1 * 0.40 * 0.4 = 0.34 \text{ cu.m.}$

No of bricks required =  $0.34 \text{ cum. @ } 550 \text{ bricks per cu.m.} = 187.$

## **5. Define floor area**

It defined as covered area i.e plinth area excluding area of walls (generally 10% - 15%) sills of the doors are not included in floor area. The floor area of every storey shall be measured separately.

## **6. Define Carpet Area**

This means area in a building which is useful one i.e. area of drawing room, dining room bedroom etc. Areas of kitchens, staircase, stores, verandahs, entrance hall, bathroom, basement etc. are excluded. It is generally 50% to 60% of the plinth area.

## **7. Define Plinth area**

It is defined area of a building measured at floor level. It is measured by taking external dimensions excluding plinth offset if any.

## **8. What are the methods of taking our estimates?**

- Center line method
- Crossing method
- Out to Out and in to in method
- Bay method
- Service unit method

## **9. Briefly explain about Out to Out and in to in method**

This method is most practicable under all circumstances and is generally followed in the P.W.D. for computing the quantities of various items.

## **10. Briefly explain about bay method**

This method is useful and is generally followed in case of buildings having several bays. The cost of the typical bay is worked out and is then multiplied by the number of bays in that building. The extra cost for the end walls and difference in framing, if there is any, should be made, so as to arrive at the correct cost.

**11. Workout the quality of stone metal required for 2Km. Length for wearing cost of a 4m wide road. The thickness of the metal road required is 12cm, loose.**

**Solution**

$$\text{Quality of metal} = 1 \times 2 \times 1000 \times 4 \times 0.12 = 960.00 \text{ cu.m.}$$

**12. An approach road 2 Km. long is to be constructed. Work out the quantity of materials required i.e. stone metal and bricks. Data is given below.**

$$\text{Length} = 2 \text{ Km}$$

$$\text{Metalled width} = 3.60 \text{ m}$$

$$\text{Soiling of bricks} = 10 \text{ cm}$$

$$\text{Wearing coat of stone metal} = 12 \text{ cm}$$

**Solution**

$$\text{Quantity of bricks} = 1 \times 2 \times 1000 \times 3.60 \times 0.10 = 720 \text{ cu.m.}$$

$$\text{No of bricks} = 720.0 \times 3.60 \times 0.12 = 3,60,000$$

$$\text{Stone metal} = 1 \times 2000 \times 3.60 \times 0.12 = 864 \text{ cu.m}$$

$$\text{Bricks} = 3,60,000 \text{ Nos}$$

**13. A cement concrete road (1:2:3) is to be constructed over the existing water bound macadam road. The thickness of slab = 10 cm. The length of the road is one km and the width 3.60m. Calculate the quality of cement and the material required,**

**Solution**

$$\text{Quality of cement concrete} = 1 \times 1000 \times 3.60 \times 0.10 = 360 \text{ cu.m.}$$

**14. Calculate the quality of earthwork for the construction of an approach road**

$$\text{Length} = 1 \text{ Km}$$

$$\text{Width of formation} = 10 \text{ m}$$

$$\text{Height of embankment} = 60 \text{ cm}$$

$$\text{Side slope} = 1:2$$

### **Solution**

$$\text{Quantity of earth work} = L (Bd + Sd^2)$$

$$B = 10 \text{ cm}; d = 0.60 \text{ m}; S = 2$$

$$\text{Quantity of earth work} = 1000 \times (10 \times 0.60) + 2 \times 0.60 \times 0.60 = 6720 \text{ cum.}$$

### **15. What are the methods of measurements of earthwork?**

The work shall be measured as given below

- Each dimension shall be measured nearest to 0.01
- Area shall be worked out nearest to  $0.01 \text{ m}^2$
- Volume shall be worked out nearest to  $0.01 \text{ m}^3$

### **16. Write the essentials requirements of contract**

- There must be an offer of one party, and its acceptance by the other party to make an agreement.
- There must be an intention of both the parties to create legal relation.
- The object of the contract must be legal, and it must not be opposed to any policy of the government or company.
- The agreement to make a contract should be supported by consideration, or recognized by law.

### **17. What are the types of contract?**

- i) Lump-sum contract      ii) Cost plus percentage of cost contract  
iii) Item rate contract      iv) Labour contract      v) Integrated contracting system

### **18. What are the important legal implications of a contract?**

- Agreement should not violate the provisions of law.
- It should not have any adverse effect on the morals of the society.
- The form of contract should be in writing and each page of the documents of the contract should be signed by both the parties.
- A contractor who refuses to carry out the work before completion can be sued in a court of law for breach of contract.



## **UNIT-III**

### **SPECIFICATION AND TENDERS**

#### **1. What is specification?**

Specification is an important document attached with a tender form / contract agreement, which in most cases controls the quality of materials and works.

#### **2. State the different types of specification**

- General or brief specification
- Detailed specification
- Standard specification

#### **3. Describe general or brief specification**

General specification gives the nature and class of work and materials in general to be used in the various parts of the works, from the foundation to the superstructure.

General specifications give idea of the whole work or structure and are useful for preparing the estimate.

#### **4. Describe detailed specification**

The detailed specifications form a part of the contract document. The detailed specification of an item of the work specifies the qualities and quantities of materials proportion of mortar workmanship, the method of preparation and execution and method measurement.

The detailed specifications of different items of work are prepared separately which description what the work should be and how they should execute and constructed.

#### **5. What are the types of penalties that are imposed on a contract and why are they imposed?**

Penalties may be imposed for non-fulfillment of conditions of contract such as not maintaining progress, delay in completion and unsatisfactory work etc. The penalty may be fixed sum per day or a percentage of the estimated cost upto 10%.

## **6. What is arbitration?**

Arbitration means the settlement of a dispute by the decision of a third person chosen and acceptable as a judge. The decision of the arbitration is binding on both the parties. In public works department the superintending engineer functions as the arbitrator parties. In public works department the superintending engineer functions as the arbitrator.

## **7. Why and when the earnest money deposits are collected?**

While submitting a tender, the bidder has to deposit with the department an amount equal to about 2½% of the estimated cost of the work which is called earnest money deposit. This amount serves as a check to prevent the contractor from refusing to accept the work or runaway, when his tender has been accepted. In case of refusal to take up the work his earnest money is forfeited.

## **8. Why and when the security deposit is collected?**

At the time of execution of the contract agreement, the successful tender has to deposit a further sum of 1% of the contract amount to the department. This amount is known as security deposit. This amount is kept as a check so that the contractor fulfils all terms and conditions to the contract. The security deposit will be refunded to the contractor on the satisfactory completion of the whole work, after the observation period of 6 months.

## **9. What is a tender notice?**

Tender notice is the publicity of offer to the contractor to quote their rates for construction for constitution work or supplied. Sealed tenders are invited in the most open and public manner. It is made public by advisement in leading newspaper, in the government gazette or by notice in English and in the regional languages in public places.

## **10. Define work.**

It means the work is to be carried out under this contract.

### **11. What is called Tender Notice?**

The notice inviting tender is called tender notice.

### **12. Define Specification**

The drawings of a structure show the propositions and its relative position of its various parts is called specification.

### **13. What are the objects of specification?**

Quality      Instruction      Aim of the project

### **14. What are the types of specifications?**

Brief specification      General specification

### **15. Define Arbitration**

Arbitration is the settlement of a dispute by the decision not of a court or law but of one or more persons chosen by the parties themselves involved in the dispute.

### **16. Define Arbitrators**

The persons chosen have the right to take decision are called arbitrators.

### **17. What are the types of Arbitration?**

- Arbitration without intervention of court.
- Arbitration with intervention of court and there is not suit pending.
- Arbitration is suits.

### **18. What do you mean by Gross income?**

It is total income that can be fetched from the property as rent or other source without deducting out goings, operational and collection charges.

### **19. Define Net income**

It is the amount left with the owner from the gross income after deducting outgoings, operational and collection expense.

### **20. Define Capital cost**

The total cost of construction of the project including land is called capital cost.

## **21. What information's should a contract document contain?**

- i) Title page      ii) Index page      iii) Tender notice and tender forms
- iv) Schedule of qualities      v) Drawings General specifications
- vi) Detailed specifications      vii) Schedule of issue of materials
- viii) Conditions of contract

## **UNIT-IV VALUATION**

### **1. Define valuation**

Valuation is the process of estimating the cost of a property based on its present condition. The properties may be immovable properties like land, buildings, mines trees quarries etc., and movable properties such as coal, oil, cement, sand etc.

### **2. What are the important factors influencing the value of building?**

- i) Type of the building      ii) Location of the building
- iii) Expected life of the building      iv) Size and shape of the building
- v) The present condition of the building      vi) Legal control of the building

### **3. What is the purpose of valuations?**

For assessment of wealth tax, property tax etc

- i) For fixation of rent      ii) For security of loans or mortgage
- iii) For insurance, betterment charges etc.      iv) For compulsory acquisition
- v) For reinstatement.

### **4. Define Floor rate**

It is the ratio between the total built up area (Plinth area) of all floors and the area of the plot.

$$\text{Floor Area Ratio} = \text{Total Plinth area of all floors} / \text{Plot area}$$

### 5. Define plinth area rate

It is the ratio between the total present cost of a particular type of building and its plinth area.

$$\text{Plinth area rate} = \text{Total present cost of a building} / \text{plinth area.}$$

**6. A property fetches a net income of Rs.900.00 deducting all outgoings. Workout the capitalized value of the Property if the rate of interest is 6% per annum.**

$$\begin{aligned}\text{Year's purchase} &= 100/6 = 16.67 \\ \text{Capitalized value of the property} &= \text{Net income} \times \text{Y.P} \\ &= 900 \times 16.67 \\ &= \text{Rs.15003.00}\end{aligned}$$

**7. Find the plinth area required for the residential accommodation for an assistant engineer in the pay scale of Rs.400.00 to 1,000 per month.**

$$\begin{aligned}\text{Average pay} &= 400 + 1000/2 = \text{Rs.700/month} \\ \text{Average month rent @ 10\% of salary} &= 700.00/10 = \text{Rs.70.00} \\ \text{Average annual rent} &= 70.00 \times 12 = \text{Rs.840.00} \\ \text{Capital cost of the building @ 6\% interest} &= 840 \times 100/6 = \text{Rs.14,000.00} \\ \text{Plinth area required @ Rs.150.00 per sq.m of plinth are} &= 14000/150 = 93.33 \text{ sq.m}\end{aligned}$$

Normally the quarters for the assistant engineer should be constructed at the cost of Rs.14,000.00 having plinth area of 93.33 sq.m.

But due to the increase in the cost of construction, this may be increased by 100% and the capital cost of construction may be fixed as Rs.28,000.00 and the approximate plinth areas of 93.33.

### 8. Define the Value

Value-Present day cost of a engineering structures (Saleable value)

## 9. Define the cost

Original cost of construction. It is used to find out the loss of value of property due to various reasons.

**10. A pumping set with a motor has been installed in a building at a cost Rs.2,500.00. Assuming the life of the pump as 15 years, workout the amount of annual installment of sinking fund to be deposited to accumulate the whole amount of 4% compound interest.**

$$\begin{aligned}\text{The annual sinking fund } I &= Si/(1+I)^n - 1 \\ &= 2500 \times 0.04 / (1+0.04)^{15} - 1 = \text{Rs.125}\end{aligned}$$

The owner is to deposit Rs.125/- annually in 4% compound interest carrying investment for 15 years to accumulate Rs.2,500/-.

**11. An old building has been purchased by a person at a cost of Rs.30,000/- excluding the cost of the land. Calculate the amount of annual sinking fund at 4% interest assuming the future life of the building as 20 years and scarp value of the building as 10% of the cost of purchase.**

The total amount of sinking fund to be accumulated at the end of 20 years

$$S = 3000 \times (90/100) = \text{Rs.27,000.00}$$

$$\begin{aligned}\text{Annual installments of sinking fund } I &= Si/(1+I)^n - 1 \\ &= 27,000 \times 0.04 / (1+0.04)^{20} \\ &\quad - 1 = \text{Rs.907.20}\end{aligned}$$

Annual installments for sinking fund requires for 20 years = Rs.907.20

## 12. Write the necessity of valuation

- Rent fixation. It is generally taken as 6% of the valuation of the property.
- For buying and selling.
- Acquisition of property by Govt.
- To be mortgaged with bank or any other society to raise loan.
- For various taxes to be given and fixed, by the Municipal Committee.

### **13. Define the Gross income**

Total amount of the income received from the property during the year, without deducting outgoings.

### **14. Define the Net come**

An amount left at the end of the year after deducting all useable outgoings.

### **15. Define the Obsolescence**

The value of property decreases if its style and design are outdated i.e. rooms not properly set, thick walls, poor ventilation etc. The reason of this is fast changing techniques of construction, design, ideas leading to more comfort etc.

### **16. Define the Scrap Value**

Scrap Value: If a building is to be dismantled after the period its utility is over, some amount can be fetched from the sale of old materials. The amount is known as scrap value of a building. It varies from 7% to 10% of the cost of construction according to the availability of the material.

### **17. Define the Salvage value**

If a property after being discarded at the end of the utility period is sold without being into pieces, the amount thus realized by sale is known as its salvage value.

### **18. Define the Capitalized value**

It is defined as that amount of money whose annual interest at the highest prevailing rate will be equal to the net income received from the property. To calculate the capitalized value, it is necessary to know highest prevailing on such properties and income from the property.

### **19. Define sinking fund**

A fund which is gradually accumulated and set aside to reconstruct the property after the expiry of the period of utility is known as sinking fund. The sinking funds may be found out by taking a sinking fund policy with any insurance company or depositing some amount in the bank. Generally while calculating the sinking fund, life

of the building is considered. 90% of the cost of construction is used for calculations 10% is left out as scrap value.

$$\text{Sinking fund (I)} = \frac{Si}{(1+i)^n} - 1$$

$$\text{Where I} = \text{Annual installment required}$$

$$n = \text{Number of year required to create sinking fund}$$

$$i = \text{Rate of interest expressed in decimal i.e. 5\% as 0.05}$$

$$s = \text{Sinking fund}$$

## 20. Define Market Value

Market value: The market value of a property is the amount, which can be obtained at any particular time from the open market if the property is put for sale. The market value will differ from time to time according to demand and supply.

## 21. Define Book Value

Book Value: Book value is the amount shown in the account book after allowing necessary depreciations. The book value of a property at a particularly year is the original cost minus the amount of depreciation up to the previous year.

## 22. Write the various methods of valuation

i) Plinth area method    ii) Depreciation rate method

iii) Rental method    iv) Land and building method    v) Development method

**23. The estimated value of a building is Rs.5,00,000. The carpet area of the building is 70 sq.m. If the plinth area is 20% more than this, what is the plinth rate of the building?**

$$\text{Value of building} = \text{Rs.5,00,000}$$

$$\text{Carpet area} = 70\text{m}^2$$

$$\text{Plinth area} = 20\% \text{ more} = 1.20 \times 70 = 84 \text{ m}^2$$

$$\text{Plinth area rate of the building} = \frac{\text{Value of the building}}{\text{Plinth area}}$$

$$= \frac{5,00,000}{84} = \text{Rs.5952.38m}^2$$



**24. The present value of a property is 2000/- Calculate the standard rent. The rate of interest may be assumed as 6%.**

$$\text{Annual rent @ 6\%} = 2000 \times 6/100 = \text{Rs.1,200}$$

$$\text{Standard rent per month} = 1200/12 = \text{Rs.1200/12} = \text{Rs.100/-}$$

**25. Write the various methods of depreciation**

- i) Straight line method                      ii) Constant percentage basis
- iii) Quantity survey method              iv) Sinking fund method

**26. Define the Year's Purchase**

Year's purchase: It may be as the figure which when multiplied by the net income from a property gives capitalized value of the property. It can also be defined as "a certain amount of capital whose annuity of Rs.1/- at a certain rate of interest can be received".

$$\text{Year's purchase} = 100 / \text{rate of interest} = 1/i$$

**27. Define the Annuity**

Annuity : The return of capital investment in the shape of annual installments monthly, quarterly, half yearly & yearly.

**28. Define Analysis of work**

The process of determining the rate of an item of work or supply of the material is known as the analysis of rate or rate analysis.

**29. What is the size of septic tank for 50 users?**

4 cum

**30. What is the size of septic tank for 25 users?**

2.5 cum

## **UNIT-V**

### **REPORT PERPARATION**

#### **1. Define Engineer**

He is the person appointed by the owner. He is technically very sound in work and his job is to see that the work is being done by contractor entirely according to drawings and specification.

#### **2. Define Owner**

The person of behalf of which work is to be done. He may be an individual or firm or organization.

#### **3. Define Site**

Site means the place where the work is to be executed.

#### **4. Define Drawings**

The section, map, pans etc... which completely define the construction work geometrically is known as drawings.

#### **5. Define contract**

The contract is an under taking by a person or firm to do any work under certain terms and condition.

#### **6. Define Contractor**

A person or a firm who undertakes any type of contract is termed as contractor.

#### **7. Define Tender**

Tender is a written offer submitted by the contractors in pursuance of the notification given to execute certain work under certain terms and conditions.

#### **8. What are the types of contract?**

- |                        |                              |
|------------------------|------------------------------|
| i) Item rate contract  | ii) Percentage rate contract |
| iii) Lump-sum contract | iv) Material supply contract |

### **9. What are the Essentials of contract?**

- The contract language is law full.
- The contract is made by parties competent to contract.
- The contract is made by free consent of the parties.
- The contract is made under valid consideration.
- There shall be a definite proposal and its acceptance.

### **10. What are types of termination of contract?**

- i) Agreement                      ii) Breach                      iii) Performance  
iv) Impossibility of performance                      v) Operation of provision of law

### **11. What are the conditions of contract?**

- Conditions relating to documents
- Conditions relating to the execution of work

Conditions relating to labour and personal