

ESTIMATING AND COSTING (THEORY-II)

Instructions:

- (1) Attempt all questions.
- (2) Illustrate your answer with neat sketches, wherever necessary.

1. Fill in the blanks (any five):

- a) Quantity is filled in **MEASUREMENT** form.
- b)** For inviting application for contract is known as **NOTICE INVITING TENDER**
- c) Contractor should submit deposit (Security) on **AFTER AWARD TENDER** time.
- d) Generally **2%** amount added for water charges in rate analysis.
- e) Nominal muster-roll is used for **DEPARTMENTAL LABOUR CLASS** of Labors.
- f) Bill of quantity is filled in **ABSTRACT** form.

2. State true or false (any five):

- i. Specifications means expenditure of work.- **FALSE**
- ii. Work-order should give to contractor after sanctioning of tenders. **TRUE**
- iii. Detailed estimate prepared by plinth area method.- **FALSE**
- iv. Measurement-sheet shows total expenditure on work.- **FALSE**
- v. Piece work method is method of Global tender.- **FALSE**
- vi. Extra item can be added in annual repairs estimate.- **FALSE**

3. Match the following pairs:

'A' Group	'B' Group
i. Measurement-sheet	a) Rates of P.W.D.
ii. Abstract-sheet	b) Guidance to contractor
iii. Rate analysis	c) Measurements of Items
iv. D.S.R.	d) Rates per Item
v. Specification	e) Expenditure on work
	f) Work-order.

4. State units of measurements (any five):

- a)** Murum filling- **CUBIC METER**
- b)** P.C.C.- **CUBIC METER**
- c) Pointing- **SQUARE METER**
- d) Window shutter- **SQUARE METER**
- e)** Wash-basin- **NOS**
- f)** Steel- **KILO GRAM**
- g) Bricks.- **NOS**

5. Attempt any two of the following:

- a) Explain the methods of executing of work.
As the question demands wast explanation, I am explaining this by writing the steps of execution how we construct building.
Suppose we are constructing RCC building of one story only That is Ground flooring.
 1. Clearing of ground for basic prepartion of work
 2. Creating preiphery wooden railing work to mark centres of column, edges of building on it.
 3. Based on set backs of building mark centres on railing & cross check entirely for set backs & actual perfection
 4. Transfer the of columns on ground from railing location with help of plumb bob, mark

- boundary of excavation
5. Carryout excavation upto hard strata by machine or manual means as per direction of RCC designer.
 6. Once required depth is reached Lay 1 :4 :8 PCC to entire pit, PCC should be in perfect levelled & plain finished
 7. Again mark centre of columns, edges of column, edges of footing on this PCC
 8. Erect reinforcement for footing, column as per design, Erect shuttering such that it will withstand all loads.
 9. Place concrete in footing portion, Compact it properly such that honey combing will be avoided, Finish the surface in neat line & level & smooth.
 10. Deshuttering the footing after final setting of concrete & cover it with gunny bags for curing.
 11. Repeat centring process for stub column
 12. Repeat reinforcement & concreteing process mentioned as above for footing.
 13. After column casted upto plinth it is work of plinth beam casting.
 14. Plinth beam may be rested on brick work, on PCC or on shuttering as per design
 15. Follow all process mentioned above for column & footing to cast plinth beams
 16. Construct plinth masonry above plinth beam or below plinth beam as per design
 17. Fill excavation fits with available murrum or purchased murrum in 0.30m layers, compact it well with proper moisture content
 18. Follow same process for plinth murrum filling.
 19. Lay dry trap rubble soling layer as per specification upto bottom of plinth PCC & compact it, Make soling layer properly leveled, well filled with murrum for voids so PCC concrete will not waste.
 20. Lay Plinth PCC in required thickness if shuttering required to edges of PCC it should be well leveled for desired plinth level.
 21. After sufficient strength gain of PCC ground floor column can be casted as methodology explained for footing casting.
 22. Columns can be casted upto 1st slab beam bottom heigh.
 23. Similarly stair case is casted following all lineout & workman ships as explained above.
 24. Shutting of slab started at this stages, all beam bottoms are placed in position, then sides of beam shuttering done, It is checked properly for beam desired sizes, diagonals of room, slab bottom elevel.
 25. Then shuttering slab is completed by proper leveling the shuttering surface, After this entire shuttering is cleaned & properly oiled so shuttering can not stick to concrete
 26. After this bar bender lay all beam & steel as per detailed drawings & direction of engineer in charge.
 27. Then preparations are made for casting of slab, Miker levelling, Weigh batcher calibration, leveling is done, also water dispenser arranged properly, Crane & miker are well placed together so that working is efficient. Also light arrangement are made if work delayed, Sufficient man power for emergency shuttering strengthening, correcting steel reinforcement location kept during concreteing process.
 28. Concrete is placed in position & vibrated well to removed entrapped air & concrete become more dense, then top surfaces are finished smooth in proper line & level This entire process should be carried that no concrete is disturbed after initial setting of cement.
 29. After final setting of cement shuttering sides of beam & slabs are removed & slab curing work started by sprinkling/spraying of water, by making ponds on slab surface etc.
 30. After 15days of curing slab shuttering is remove & 21 days of curing beam bottoms are removed.
 31. After cleaning masonry work starts, it is in stages like sill level, lintel level & beam bottom level. Masonry should be in correct line & level and as per drawing, it should cured for atleast 15 days, During masonry all door & window frames are fixed & lintels are casted as per need.
 32. After masonry curing, internal plaster activities starts, Surfaces are prepared for cleanly ness, loose materials are removed & thiyas are made in connection with proper line &

levels, Next actual process of plaster carried as per finished, specification given, higher workman ship is required to make plaster. Where dado tiles are required to paste surfaces are made rough with help of wire. Plasters are done just above skirting level

33. Similar processes are followed for external plaster.
34. Then water proofing of roof slab carried as per specifications, proper slopes are maintained in water proofing to drain water quickly.
35. After int plaster flooring work starts finished surface levelled is marked on walls in connection with stair case, Mortar are prepared as per specification laid according flooring thickness & tile thickness, Then tiles are fixed with application of cement slurry, after work done tiles are cleaned for cement slurry patches. Flooring is then cured for 15 days & joints are grouted with cement grouts.
36. After tiling Skirtings & dado tiling works are done tiles are sticked to wall surfaces with thick cement slurry with proper line & level, joints are kept open to make curring proper, surfaces are cleaned for cement slurry. After 15days curing tile joints are grouted with cement grout.
37. After plaster & tiling work completes, Pipe lines of water & drainage line dones, Also electrical lines are installed, Door/Window shutters are installed. Sanitary fittings are installed.
38. Then painting work is carried out as per specifications.
39. After cleaning of entire rooms is done for final look, CP fittings, Electrical fittings, Glass pannels of window are installed.
40. Thus project is ready for lock & key & hand over.

b) Which points to be observed on framing of tender notice?

Tender document related :

1. Tender notice
2. Contractor qualification
3. Blank tender form cost
4. Tender sale date
5. Last date for tender subissions
6. Date for query resolution.
7. Date of opening tender
8. Procedure to submit tender.
9. EMD- Earnest money deposite.
10. Tender evaluation criteria

Project related :

1. Estimated cost of project
2. Time allotted for completion of project.
3. Time allotted for mobilisation- Start date for project
4. Security deposite.
5. Terms & conditions
6. Bill of quantities
7. Specification
8. Tender drawings

c) Explain the various modes of payment to contractors.

1. Interim bill-

Advance : this advance is given with work order without any security as there is negotiated clause in work order, Such types of advances are many times given to supplier.

Secured advance : this advance is given by client to contractor against some security, This security may be in the form of Bank Guarantee, Some tools tackles, Heavy machinery, Scaffolding brought by contractor or some material of construction

brought by contractor

Running account (RA) bill : This is payment made to contractor during project cycle in intervals of time. The bills are named as Running account bill & recorded against that work order identification number.

In this bill partial work done upto bill date stage is measured recorded & paid. Appropriate deductions & additions are made to account for like advances, client material supplied amounts, taxes, Retentions, Royalty PF etc.

2. **Final bill** : this final bill of the work order in consideration, after this bill contractor can not claim any thing missed in his billing. This bill should be complete in all respect of work done. It should be write entirely based on Checked Running account bills, All documents related to closer of work order should be attached this bill, All advances, deductions, Penalties, Reconciliation of materials are settled before completion of process of this bill
3. **First & final bill** : This method is mainly used when materials are purchased as many times bill cycle is only one number, so bill is called as First & final bill, All additions & deductions are applied to this bill & contractors claims are settled, After this bill process contractor can not claim any thing.

d) Write specification on Burnt Brick Masonry.

BRICK :

1. Brick should be of 1st quality, All edges should be shape, in line without breakage, All corners should be perfectly in right angle
2. Colour of brick should be uniform & red in colour.
3. Brick should give clear ringing sound if two bricks striked on each other.
4. There should not be any crack on brick surface
5. Compressive strength of brick should not less than 105kg/Sqcm
6. Moisture absorption in brick should not be greater than 1/6th weight of brick
7. Bricks should be soaked in water for 24hrs before use in masonry

SAND

1. Sand should be procured from river bed
2. Sand particles should be round in shape
3. Silt or soil content in sand should be zero
4. Sand should be washed sand
5. Particle size of sand should not be greater than 3mm

CEMENT

1. Cement should be of specified brand of ISI marked
2. Cement should be fresh, its manufacture age should be less than 1month before using it for work.
3. Cement should be of specified grade & specified manufacturing process.
4. Cement should be stored under roof avoiding direct contact of sun, air & water.

PROPRTION

1. Proportion of cement & sand should be 1 :6,
2. For mixing of mortar Steel trays should be used
3. Sand should be volume batched for work
4. First mortar should be mixed dry, then after adding it should be again mixed
5. Volume of mortar should be such that it should be consumed within 1.0hr

WORKMANSHIP

1. Masonry should be perfect line & level & should be drawings.
2. Bonding should be in English bond
3. Mortar joint should be less than 12mm
4. Frog of brick should be on top surface of brick
5. Mortar joints should be raked properly, Masonry surfaces should be cleaned before closing of day work

CURING

1. Water should be sprinkled on masonry surface such that all bricks get soaked properly, it should be 3-4 times in a day
2. Curing should be done for 15days
3. Curing should start after final setting of cement over.

TOOLS/TACKLES

1. All required tools tackles should be brought by contract at his own expenses, they should be well in working condition, Scaffolding required for should be in good working condition, It should be strong enough to hold all working loads, Scaffolding should be removed after work completion & brick work should be corrected immediately for holes due to scaffolding.

UNIT OF MEASUREMENT

2. Unit of measurement is in cubic meter, Accuracy for length measurement should be 0.005m, Accuracy for quantity measurement should be 0.001cum

6. Attempt any two of the following:

- a) Prepare a rate analysis for PCC-1: 2: 4 for 1 m³.

Wet volume of concrete= 1cum

So add 45% for dry volume of concrete

Dry volume= 1 x 1.45= 1.45 cum

Concrete contains 1+2+4 = 7 parts

So cement content = 1.45/7 x 1 = 0.207 cum

= 0.207 x 1440 kg/cum= 298 kg

= 298/50 = 5.97 bags

Sand = 1.45/7 x 2 = 0.414 cum

Aggregate= 1.45/7x 4= 0.828 cum

Summary-

Cement = 5.97 bag

Sand= 0.414 cum

Aggregate = 0.828 cum

Assume rates cement – 280/bag, Sand = 2500/cum, Aggregate= 1300/cum

So amounts=

Cement= 5.97 x 280= 1671.6

Sand= 0.414 x 2500 = 1035.00

Aggregate= 0.828 x 1300= 1076.40

Total= 1671 + 1035 + 1076 = 3783

Rate of PCC 1 :2 :4 = 3783/cum

- b) Prepare a rate analysis for oil-painting on new plastered wall surface.

Description	Quantity	Unit	Rate	Amount
Material required for 10 sqm				
Primer paint	1.00	Litre	100.00	100.00
Oil paint	1.00	Litre	225.00	225.00
Whiting Powder	2.00	kg	20.00	40.00
Turpentine	0.50	Litre	100.00	50.00
Polish paper	2.00	Nos	20.00	40.00
			Total=	455.00
Labour for painting – 30% of Material cost	30%	%	455	136.50
Labour + Material				591.50
Add 10% as contractor's profit & over heads	10%	%	591.50	59.15

			Total=	650.65
			Say=	650.00
This is amount for 10sqm				
So rate for 1sqm	=650/10	=65.00		
So rate				65/sqm

c) Calculate the quantities of materials for R.C.C. Lintel Size—25cm×25cm ×1meter

Concrete qty for Lintel= $0.25 \times 0.25 \times 1 = 0.0625 \text{ cum}$

To calculate dry volume add 45% in Wet volume

So dry volume of concrete= $0.0625 \times 45/100 + 0.0625 = 0.0906 \text{ cum}$

Assume concrete grade M20 That is 1:1.5 :3 proportion for cement,

Sand & metal, So total parts in concrete = $1+1.5+3 = 5.5$

So cement part in concrete = $0.0906/5.5 \times 1 = 0.0164 \text{ cum}$

= $0.0164 \times 1440 \text{ kg/cum} = 23.73 \text{ kg}$

= $23.73/50 = 0.474 \text{ bag}$

So Sand part in concrete = $0.0906/5.5 \times 1.5 = 0.0247 \text{ cum}$

So aggregate part in concrete = $0.0906/5.5 \times 3 = 0.0494 \text{ cum}$

Consider 120 kg/cum of concrete to calculate steel as There is no data given

So steel = $0.0625 \times 120 = 7.5 \text{ kg}$

Summary :

Cement= 0.474 bag

Sand= 0.0247 cum

Aggregate= 0.0494 cum

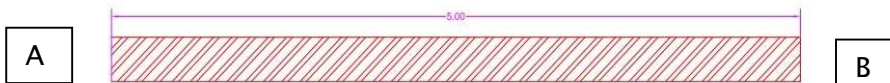
Re reinforcement steel= 7.5 kg

d) Enlist documents for tender preparation.

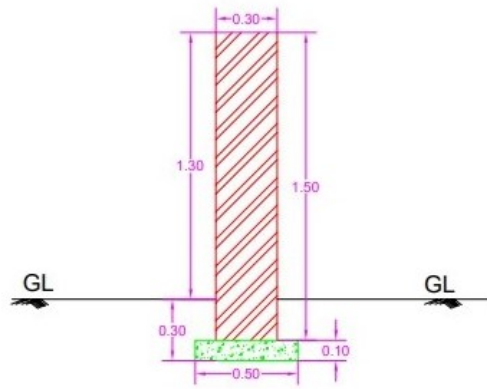
1. Tender notice
2. Bill of quantities
3. Drawings
4. Specifications
5. Terms & conditions
6. Formats like for BG, Water proofing guarantee etc.
7. Brands of materials, Recommended suppliers etc.
8. Basic rates

7. Attempt any two of the following:

a) Calculate the quantities for brick-work, excavation and plastering, bed concrete for the wall— Length – 5meter, Width – 0.3meter, Height – 1.5 meter. Wall below ground level – 0.3 meter.



PLAN



SECTION

Sr no	Description	Nos	Len	Bre	Dep	Qty	unit
1	Excavation						
	Wall A-B	1.00	5.20	0.50	0.30	0.78	cum
2	PCC 1:4:8						
	At foundation level						
	Wall A-B	1.00	5.20	0.50	0.10	0.26	cum
3	Brick masonry 1:6 in clay bricks in foundation						
	Wall A-B	1.00	5.00	0.30	0.30	0.45	cum
4	Brick masonry 1:6 in clay bricks in superstructure						
	Wall A-B	1.00	5.00	0.30	1.20	1.80	cum
5	Sand face plaster 1:4 in super structure						
	Assume plaster made 0.15m below ground level						
	Wall A-B	2.00	5.00		1.45	14.50	
		1.00	5.00	0.30		1.50	
		2.00		0.30	1.45	0.87	
					Total=	16.87	sqm

- b) Draft a tender notice for approximate cost of 5 Lacks, Anganwadi Centre at Satara.

Work name	Estimated cost	Cost of blank tender form	Earnest money deposite	Time period for work completion	Type of tender
Anganwadi centre located at Satara	Rs. 5,00,00.00	Rs. 500.00	Rs. 10,000.00	8 months	Item rate tender

- c) Explain the Long Wall – Short Wall Method.

This method is used mainly in load bearing type structures.

Gives more accuracy than centre line method while calculating quantities of load bearing structure.

Method is simple & produce results are error free & less mistakes occur in this.
 As this method uses graphical representation understanding dimension is easy.
 As drawings provides clear idea of measurements no imaginations required.

d) Differentiate between the detailed and approximate estimate.

APPROXIMATE ESTIMATE	DETAILED ESTIMATE
It is based on old estimates of same type of work	It is entirely made from scratch
Drawing of building is not required to make approximate estimate	Detailed drawings, specifications, labour & material current rates required to prepare estimate
Less efforts required to make	Too much efforts required to prepare estimate
Accuracy of estimate is less as many factors are unknown	Every factor of project are known so estimate is of high accuracy
Not sufficient for Tender process, loan processes, They just give rough idea of expenditure	This estimate provides every detail require tendering, It is important document for loan proposal.

8. Write short notes on (any four):

a) Specifications

1. Specification is detailed description of how to do work for item work
2. It states methodology to be followed, quality of materials, quality of workman ships.
3. It states lead & lift for work.
4. It states requirements of tools, tackles, machinery, scaffolding etc.
5. It states Do's & Don'ts.
6. It states about basic rates of some materials.
7. It staes how to measured item of work.
8. It states which drawing to refer, which code to refer, how Engineer in charges instructions to follow

b) Rate List method

This item rate Tender/Contract method.
 In this detailed list of specifications worked out, Detailed quantities are prepared & blank forms of bill of quantities are issued to bidder for quoting there rates. The contractor whos is lowest genrally tenders are awarded. While this method gives most flexibility in variation in quantity that is actually executed but this method also not forecast final cost of project. Due to flexibility in variation in quantities contractor is relaxed for any varriation in quantity, Client is also relaxed as he pays only for work done amount. But there is tendency client lowers the high value items later or contractor will look increase high value items.

c) Secured – advance

These are payments made as advance payment in case emergency by calculating roughly work done amount or cost of material that contractor brought for construction. Form no 26 is used for such types of payments.
 The amount decided for payment is 75% of rough work done cost worked out or contractor's material at site.
 After such payments are made contractor is bound to use the material bought site for same project he can not shift to other site. This advance is deducted in next running account bill as full advance amount, it is not deducted in instalments.

d) First and Final payment of Bill

When work is of short duration or quantum of work is less or project cost is less then only one bill is prepared for such work after work completion & title is given as « First & final bill ». Generally this billing system is used for payments of material suppliers.

e) **Work-order.**

Work order is legal & official document given by client to contractor after signing both parties as token of agreement of terms & conditions mentioned in work order. It is green signal for both parties to actually start the project.

Like contract document work order have many terms & conditions, Bill of quantities, specifications & drawings attached.

This « work order term » is given to agreement in Private sector as Client issue it to contractor.

9. **Attempt any two of the following:**

a) Differentiate between the Tender and Contract.

Tender	Contract
Tender is document used to invite bids from contractor for particular project	Contract is process where agreement between client & contractor officially signed to give signal both parties project execution can be started now
Tender copies are multiple given to every bidder	Contract document copies are limited, Two original copies prepared, Each one remain with client & contractor
Security in the form of EMD required to give client with bid document	Security in the form of security deposite require to give to client before start of work or within stipulated time
Generally 2-3% of estimated cost of work is taken as EMD	Generally 5-10% of estimated cost of contract taken as Security Deposite.
EMD is returned to unsucessfull bidders after award of work to selected contractor	This is not applicale here
If selected contractor rejects to accept offer from client, Client forfeit this EMD to recover his losses	This is not applicale here
This is not applicale here	If contractor fails to perform any condition given in contract, client give penalty to contractor as per respective clause mentioned in contract
Term « Tender » is used upto award of work to particular contractor	Term « Contract » is used when contractor & client signs the document « Contract award »

b) Enlist the conditions of Contract.

Main two types

1. General conditions
2. Special conditions

General conditions- These are common conditions present in all tender documents, Format of same is standardised in DEPARTMENT & blindly used for any tender only some minutes changes in this format required like Name of project, Address of project etc.

Special conditions : These are specific for every project, They were produced for every project separately. There is no boundry for generating these conditions. Only condition is that they should be perfectly transperant so that both parties make their understanding clear that is what they need to supply & what returns they will get .

c) Write necessity and factors affecting rate analysis.

Necessity of rate analysis :

1. It is systematic work of rate for item of work
2. It considers quantities of all resources like labour, material & machinery
3. It considers all lead & lift required for work to be done
4. It is based on actual market rates of labour, material & machinery.
5. It considers Profit & overheads on percentage basis to be applied on Labour, material & machinery, So even if you don't have detailed working for profit & overhead still you can work out rate for item of work

Factors affecting rates :

1. Fluctuations in rates of material, labour & machinery.
2. Methodology of construction
3. Lead & lift for work required.
4. Government regulation
5. Climatic conditions
6. Location of project.

d) Write a note on Service unit method and Carpet area.

Service unit method :

1. This is approximate estimation method
2. In this method rate of costing is worked out from old estimates or from actual completed project incurred. The unit of measuring rate is per no of students for school, per no of beds for hospital, per no of chairs for cinema theatre or stadium etc
3. This method is more suitable for commercial projects as understanding of costing is based on realtime unit instead of plinth area.

Carpet area :

In this total area of floor worked & following deductions made to calculate carpet area

1. All wall area deducted
2. Kitchen room area deducted
3. Stair area deducted
4. Common passages deducted
5. Toilet, WC, Bath area deducted
6. Porch/Verandha deducted