

Internal Assessment Test - I

Sub:	Electrical Estimation and Costing					Code:	17EE553		
Date:	07/09/2019	Duration:	90 mins	Max Marks:	50	Sem:	5	Branch:	EEE
Answer Any FIVE FULL Questions									

		Marks	OBE	
			CO	RBT
1a	Define the following i) Market Survey ii) Contingencies iii) Overhead charges	[5]	CO1	L1
1b	Describe the following i) Profit ii) Comparative Statement iii) Electrical Schedule iv) Catalogue	[5]	CO1	L1
2	Mention the different modes of tendering and explain process involved.	[10]	CO1	L2
3 a	State the necessity of estimating & Costing.	[5]	CO1	L1
3b	List out any five rules of India Electricity.	[5]	CO1	L2
4	Explain how the cost material and labour is worked out for executing a given work.	[10]	CO1	L2
5	Mention the general rules for internal wiring system.	[10]	CO2	L2
6a	Mention the different types of cable used in internal wiring.	[5]	CO2	L2
6b	Describe the following i) Multi strand cables ii) Fuses and its Types	[5]	CO2	L2
7	Explain the determination of Points, Total load, Number of sub circuits, ratings of Main Switch & Distribution board and size of conductor	[10]	CO2	L4

Scheme of Evaluation:

- 1a i) Market Survey----- 2 Marks
ii) Contingencies ----- 1 Mark
iii) Overhead charges----- 2 Marks
- 1b i) Profit----- 1 Mark
ii) Comparative Statement----- 1 Mark
iii) Electrical Schedule----- 1 Mark
iv) Catalogue----- 2 Marks
- 2 Modes of tendering-List----- 4 Marks
Explanations----- 6 Marks
- 3a Necessity of estimating & Costing (6 points) ----- 5 Marks
- 3b Five rules of India Electricity (Each rule x1)----- 5 Marks
- 4 Explanations for cost of Material----- 5 Marks
Explanations for Labor cost----- 5 Marks
- 5 General rules for internal wiring system—10 rules—10 Marks
- 6a List of cables----- 2 Marks
Explanations----- 3 Marks
- 6b i) Explanations Multi strand cables----- 2 Marks
ii) Explanations Fuses and its Types----- 3 Marks
- 7 Determination of Points, Total load, Number of sub circuits, ratings of Main Switch & Distribution board and size of conductor-----5 x2 = 10 Marks

Solutions:1 a)

MARKET SURVEY & SOURCE SELECTION:-

Good estimating is possible only with an update knowledge of

- (i) availability of products
- (ii) sources for production, vendor selection
- (iii) new products and their quality
- (iv) prices of products, discounts etc.

A market survey for collection of the above information and retention of the same in a library helps in easier estimation and decision making for selection of materials and vendors.

⇒ Greater importance of market survey to ensure timely availability of materials essential for completion of projects.

⇒ Non-receipt of materials in time

↳ production/jobs holdups

↳ burden of cash flow.

↳ consequently delay will occur.

⇒ Market survey also ensure

↳ availability of products

↳ to obtain necessary approvals of approved suppliers/vendors. — to avoid poor quality of products.

For easy to estimator

(i) Retain a list of approved suppliers/vendors both in alphabetical order and also product wise.

(ii) Retain a list of approved standard products.

⇒ Also get adv/assistance can be taken similar surveys conducted by the state or central PWDS or MES standard schedules of Rates/Specification
↳ Manufacturing enterprise solutions

CONTINGENCIES:-

Unforeseen expenditure such as to cover extra cost on account of

↳ delays in delivery

↳ minor accidents

↳ unforeseen variations from the plans of estimating department.

Such expenses may be due to natural calamities such as floods, earthquakes etc.

usually expressed in % of total cost [material+labour]
say, 5%.

Overhead charges:-

Overhead charges (or) Standing charges of the business cover all expenditure necessary to carry out the business.

charges for

- ↳ Rent of offices and workshop
- ↳ allowances for wear and tear of the buildings
- ↳ plant and machinery [depreciation]
- ↳ wages of clerical staff
- ↳ general expenses
- ↳ rates & taxes
- ↳ lighting and heating
- ↳ advertising, insurance, postage and telephone
- ↳ carriage and general travelling expenses
- ↳ legal cost and bad debts etc.

1b)

Electrical schedule:

↳ is the list or plan of building which provides us the information regarding the number of points.

↓
ceiling outlets, bracket outlets, single pole 3 way and 4 way rotary switches, wall plugs and other special plugs in each room of the building under estimation.

Catalogues:

- (i) Estimator should have
 - ↳ up to date pricing catalogues
 - ↳ quotations from manufacturers
 - ↳ details of wholesale dealers for the special material.
- (ii) Estimator saves time by making judicious selection of standard catalogues which are most useful for his work.
- (iv) Trouble can be achieved, price list prepared his own price list consisting of net figures. [less discount allowable].
Bulk quantities [more discount allowable].
- (v) Apart from catalogue, special price list has to prepare for, cost of conduit per metre run, complete with conduit accessories, cost of cable per metre run, cost per metre run of mains and submains and cable runs.

Comparative Statement:

- Important document to evaluate the offers received against an enquiry
- Care must be exercised while preparing comparative statement
- Any deviation from the tendered specifications, delivery conditions, assistance etc., stipulated by the tenders should be highlighted

PROFIT:

↳ usually added in the form of percentage to the gross or true cost of the job in order to determine the selling price of the job.

Amount depends on

- ↳ size of the job with him.
- ↳ Degree of competition
- ↳ state of turnover
- ↳ His anxiety to secure a particular job and so on.

Estimate has been prepared accurately, definite percentage of contingencies, standing charges and profit is added, it will be a profit never be a loss.

2) Tendering:

Modes of Tendering:-

1. Open Tendering
2. Global "
3. Limited "
4. Single "
5. Proprietary "
6. Spot "

Open Tendering:-

- ↳ Advertisement in atleast three leading english language newspapers of All India circulation.
- ↳ if time permits, also in Indian Trade Journal, India Export Service Bulletin (IESB)
- ↳ Simultaneously copies of advertisements sent to all the known and likely sources.

Global Tendering:-

↳ Advertisements may be released in leading national newspapers as well as in Indian Trade Journal / IESB.

↳ A tender copy will be displayed to the Trade Commissioners of Foreign Embassies in India - Potential vendors from abroad may offer tendering.

Limited Tender:

- ↳ only the most likely and suitable sources are addressed.
- ↳ at least five sources of supply are addressed
- ↳ Supplier - decided based on past experience.

Single Tender:-

- ↳ an offer from a single source is invited.

Common occasions of this category are given below:-

- ↳ a) Market research reveals that there is only one known reliable source of supply.
- b). When the management is the interest of real long term economy and quality assurance and assured service standards of delivery etc
 - ↳ Standardises on a particular brand/make
- c) Single party ready to ~~take~~ undertake the risks provisioning/development of items required and value of order is such that it is not economical to develop alternative sources of supply.
- d) the manufacturer/government has limited the supply to only a single source.
- e) the item is known to be in short supply and its stocks happen to be available only with one source at the time of purchase.

- f) Supplies from fair price shops, Super bazars, Government, Semi government, Co-operative undertakings.
- g) Direct purchase from reputed manufacturers or their accredited dealers.

Proprietary Tender:-

↳ proprietary manufacturer/his authorised agent because no equivalent or near equivalent is available from any other source.

Spot tendering:-

- ↳ resorted only for emergent requirements.
- ↳ All the readily approachable and well known vendors are requested to assemble and their offers are obtained after the requirement is explained/shown to them on the spot.

Tender Form:

- ↳ A form on which an offer is made from a party to make supply or undertake some work at its quoted rates on some specified conditions.
- ↳ Tender is usually accompanied with an amount called as earnest money.
- ↳ Earnest money is the guarantee of the tenderer to deposit the required security and to enter into the required agreement on intimation of the acceptance of his tender.
- ↳ After acceptance of tender, the tenderer deposits security, which is his guarantee for due fulfillment of his contract.

Guidelines for inviting Tenders:-

1. Whenever practicable and advantageous the contract is executed only after tenders have been invited.

↳ work (or) repairs — tenders ^{are} always invited.

2. Tenders are ordinarily invited on tender forms prescribed for the purpose.

If any alteration is made, it should be done after taking prior sanction of the competent authority.

3. Advertisement in Government Gazette, local papers, notice ^{boards} in English, Hindi, local languages about the tenders

↳ Tenders which are always sealed.

4. The tender notice always states:-

a) The place where and the time when

↳ notice documents can be seen

↳ blank form of tenders to be obtained.

↳ also the amount, if any, to be paid for such forms of tenders.

b). Place where, the date on which, and the time when the tenders are to be submitted and are to be opened.

- c) The amount of earnest money to be deposited [☺]
and the amount and the nature of the
security deposit required in the case of
the accepted tenders.
- d) With whom is which authority the acceptance
of tender will rest.

5. In case of large contracts

↳ at least one month time from the
date of advertisement to submit a tender
form.

Authority have rights to reject any or all of the
tenders so received without giving any reason.

- b. All tenders received for the same contract
are opened by the competent authority in
person at the advertised time and place in
presence of such of intending contractors.

7. The earnest money of unsuccessful tenders
is refunded to the tenderers as soon as possible
after the disposal of tenders.

8. Usually the lowest tender is accepted,

↳ financial status of tenderer should be
ascertained before accepting.

3 a)

Introduction: Necessity of Estimation & Costing.

⇒ To start a new project - a management have a goal/proach

↓
To know about material required.

⇒ Material Required means

- with complete specifications
- Qty of each item
- Cost to be incurred.

} before taking a new project in our hand.

⇒ Prepare a project report

↳ it includes the complete details of work to be carried out such as

- ↓
- detailed drawing of work
- complete details of the required materials with costing
- sequence of operations is to performed.

⇒ Estimation also essential to provide accurate amount to be required availability of material etc.

⇒ In case without estimation, a project has been taken in hand ^{costing} may leads to difficult and work may be stopped due to non-availability of money and materials.

3 b) List any five Rules:

- IE Rule - 29 Construction, Installation, Protection, Operation and maintenance of Electrical Supply Lines and Apparatus
- IE Rule - 30 Service Lines and apparatus on consumer's premises
- IE Rule - 45 Precautions to be adopted by consumers, owners, occupiers, electrical contractors, electrical workmen and suppliers
- IE Rule - 46 Periodical Inspection and testing of consumer's Installation
- IE Rule - 50 Supply and use of energy
- IE Rule - 54 Declared voltage of supply to consumer
- IE Rule - 55 Declared frequency of supply to consumer
- IE Rule - 77 Clearance above ground of lowest the conductor
- IE Rule - 79 Clearance from buildings of low and medium voltage lines and service lines

4.)

DETERMINATION OF REQUIRED QUANTITY OF MATERIAL

⇒ Determination of quantity of casing-capping, batten (s) conduit and wire for house wiring is very tedious job.

⇒ First step - decide the layout

⇒ Form layout - From meter box onward calculate

↳ leads from meterbox to main board

↓
write down the size and lengths

↳ wire/cable b/w supplier's main board to consumer switch fuse

↳ main switch with its type and capacity.

↳ wire/cable b/w main ~~board~~ switch and distribution board

↳ capacity and ~~a~~ number of ways from the plans and sections of the building.

⇒ Finally list the quantities required from fuseboard to the switch outlet.

↓
Do systematic to avoid error by omitting some wiring work which may be essential.

⇒ Then list out the switches, switch boxes, pendants, sockets and other items.

⇒ Small amount is added to cover the cost of screws, sawd plugs and other minor requirements.

Determination of Required Labour Conditions:

- ⇒ Most difficult item to estimate is Labour.
- ⇒ Construction building
↳ all cutting and making good will be done by the building contractor.
- ⇒ Simultaneously cutting and construction is going by survey well in advance to the building supervisor.
- ⇒ This is not done until the work and plastering is finished.
- ⇒ Wiring up is done just prior or just after the priming coat of the ~~bricks~~ paint.
- ⇒ Fitting of switches and pendants is nearly the last part to be completed.

Determination of Cost Material and Labour:

- ⇒ Best way to determine the cost of material - from table → Recording of estimates.
↓
Complete specification and quantities required.
↓
Prices from catalogue and determine total cost.

Labour cost one of the following method:-

(2)

(i) Determination of no. of points, taking two points for main board and one point for sub circuits.

7 65, 75, 105 and 125 per points based on type of wiring either cabling-coping, batten

(ii) Labour required calculate and find the cost of labour at per class:-

Blacksmith Grade I - 350/day

Grade II - 250/day

" " " " " "

Carpenter Grade I - 350/day

Grade II - 250/day

Smiling man, wire man and labor who clear it will be there

(iii) Provide the labour charges at 15%, 20% (b) 25% of material cost.

5.) General Rules for Internal wiring:

1. The minimum size of conductor used in domestic wiring must not be of size less than 1/1.12mm in copper or 1/1.40mm (1.5mm) in aluminum wire.
2. For flexible wires the minimum size is 14/0.193mm.
3. The height at which meter board, main switchboard are to be fitted 1.5 meters from ground level.
4. The casing will be run at a height of 3.0 meters room ground level.
5. The light brackets should be fixed at a height of 2 to 2.5 meters from ground level.
6. The maximum number of points in a sub circuit is 10.
7. The maximum load in a sub circuit is 800W
8. I.E. rule no. 48 the insulation resistance between the wiring of an installation and earth should be of such a value that the leakage current may not exceed 1/50000 the part or 0.02 percent of the F.L. current.
9. The permissible voltage drop in a lighting circuit is 2% of the supply voltage plus one volt.
10. The maximum permissible voltage drop in a power industrial circuit should not be more than 5% of the declared supply voltage.
11. The insulation resistance should not be more than 50 M outlets and need not to $\Omega 5$. In any case the value should not be more than 0.5 M be more than one mega-ohm.
12. In case of PVC wires, insulation resistance must be 12.5 M outlets
13. The earth resistance should not exceed the value of one ohm. Higher than this value shows that conduit or switch has not been properly earthed.
14. In a power sub circuit the load is normally restricted to 3000 watts and number of outlets to two in each sub circuit.
15. All equipment used in power wiring shall be iron clad construction and wiring shall be of the armored cable or conduit type.
16. The length of flexible conduit used for connections between the terminal boxes of motors and starters, switches and motors shall not exceed 1.25 meters.
17. Every motor, regardless of its size shall be provided with a switch fuse placed near it.

18. The minimum cross-sectional area of conductor, that can be used for power minig of 1.25 mm for copper conductor cables and 1.50 mm for A1 conductor cables (refer ISI recommendations). Hence VIR or PVC cables of size lower than 3/0.915 mm copper or 1/1.80 mm A1 cannot be used or motor wiring.

19. For motors below 15 bhp which have a very heavy starting current a fuse should be of current rating to carry the starting current of motor safely and cable should be of current rating not lower than half of the current rating of fuse.

6 a) Different types of cable used in Internal Wiring:

TYPES OF CABLES USED IN INTERNAL WIRING:

According

- (i) Conductor used
 - Cu conductor cables
 - Al conductor cables
- (ii) No. of cores
 - Single core
 - Twin core
 - Three core
 - Twin core with ECC [Earth continuity conductor]
- (iii) Voltage grading
 - 250/440V cables
 - 650/1,100 Volt cables
- (iv) Type of Insulation
 - ↓
 - a) Vulcanised Indian Rubber (VIR) insulated cables
 - b) Tough rubber sheathed (TRS) (or) Cell type (CTS) sheathed
 - c) Lead sheathed cables
 - d) PVC cables
 - e) Weatherproof cables
 - f) Flexible cords and cables
 - g) XLPE cables.

6 b) i) Multi Strand Cables:

Multi-strand cables:

- ↳ more flexible and durable
 - ↳ can be handled conveniently.
- ↳ Surface of multi strand cable is more compared to SA of single solid conductor
 - ↳ Heating radiating capacity is more.
- ↳ Skin effect is better as the conductors are tubular specially in case of high frequency.

↳ No. of strands: 3, 7, 19, 37, 61, 91

↳ wires to obtain circular contour.

↳ bending the shape.

↳ 3 — touching one another — three circles.

↳ 7 → one central wire with 6 wires surrounding it

↳ 19 → 12 wires surrounding the seven strands.

↳ 37 → 18 wires " " 19 strands and so on.

⇒ Various conductors are spirally round the central conductor and when there is more than one layer, alternate layers are spiralled in opposite directions → to prevent "bird caging" when the conductor is bent.

⇒ Spiralled → central conductor length is less compared to outer @ spiralled conductors.

6 b) ii) Fuses & its Types:

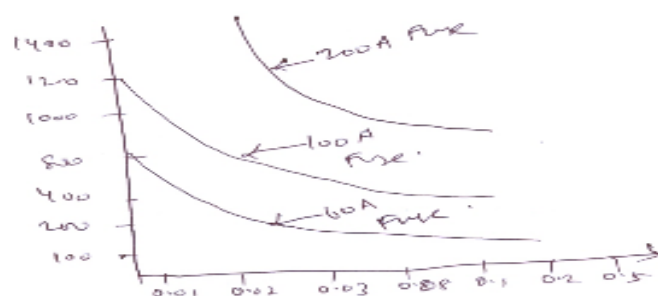
Fuses:

↳ simplest and cheapest device used for interrupting an electrical circuit under S/C, excessive overload etc.

↳ S/C/fault → fuse element heated/melts and break the circuit.

↳ Time for blowing out of fuse depends upon the magnitude of excessive current.

↳ Larger current — rapid time of operation.
i.e., inverse current time characteristics.



Types of fuses:

1. Ordinary fuse:

↳ metal strips - link the connections.

Adv:

1. unreliable operation

↓
oxidation of fuse wire.
loose connection
Heating devices used
Single phasing of S/C I.M.

2. Lack of discrimination.

↳ absence of something required.

3. Small time lag.

4. Misuse - improper sized wire

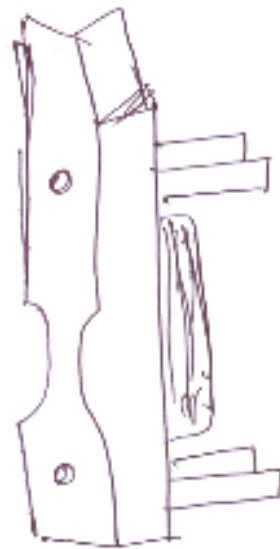
5. Low Rupturing capacity →

↳ limited to 4kA in faulty circuit.
↓
carries S/C current safely for a given time period.

breaking capacity of fuse is max. available current without any physical rupturing.

Adv:

1. cheapest
2. requires mini. time to replace.
3. No maint.
4. current limiting effect.

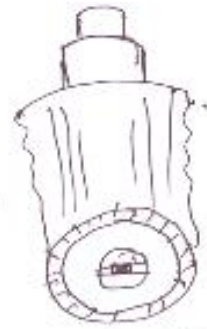


2. Screw-plug type fuses:

=> used in electric machinery cuts. of 220 V.

=> 3 to 30 Amps

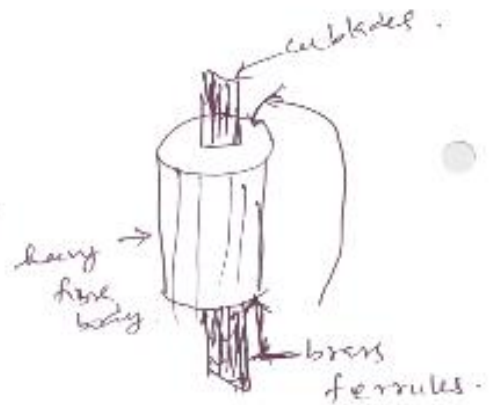
=> fuse link can be enclosed by porcelain or glass body.



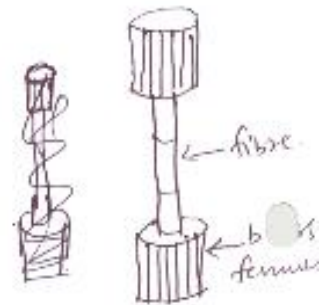
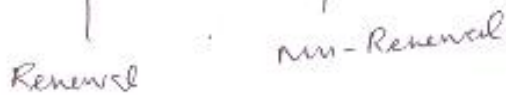
3. Knife Blade Cartridge fuses:

=> used in heavy power lines
60 to 600 Amps and 250 volts
and more.

=> heavy Cu blade

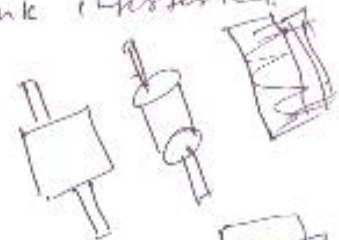


4. Ferrule type cartridge fuse:



=> Renewal type has a small screw plug in each end.
which can be renewed and ^{new} link inserted.

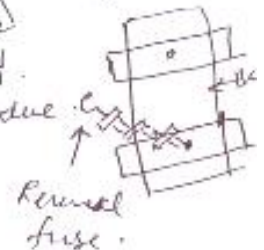
=> 100 Amps and 250 volts.



5. HRC (High Rupturing Capacity):

=> used where high power is supplied.

=> definite breaking capacity and a high value.



7.

(12)

Determination of Number of Points: (Light, FAN, SOCKET-OUTLETS)

No. of Light Points

- ↳ as per the size of the room.
- ↳ illumination level required
- ↳ luminous efficiency of the lamps to be used.

For Fan:

- ↳ as per length, width and height of the room.
- ↳ and size of the fans to be used.

Fan size in mm.	Type:	Air Delivery in m ³ /minute	Room sq. metre
900mm.	Capacitor AC d.c	140 140.	7-10
1200mm	"	215 215	10-12
1400mm	"	270 270	12-14
1500mm	"	300 300.	>14

Socket outlets (IS 4648-1968)

Location	No. of 5A socket outlets	No. of 15A socket outlets
Bedroom	2 to 3	1
Living-room	2 to 3	2
Kitchen	1	1
Dining room	2	1
Garage	1	1
For refrigerator	-	1
For AC	-	1
Verandah	1 per 10m ²	1

Determination of Total Load:

(10)

- (i) Fluorescent lamps
choke type - 50W
(40+10)
- (ii) Incandescent lamps, fans and socket outlets - 60Watts.
- (iii) Power Socket outlets - 1,000 watts.
- (iv) Exhaust Fan - as per capacity of exhaust fan.

Determination of no. of sub circuits:

- ↳ as per no. of points to be wired
- ↳ total load to be connected to the supply system.

⇒ In one light and fan subcircuit

↓
max. load 900 watts
to points to be wired.

⇒ In one ^{power} sub circuit

↓
max. load 3000 watts
no. of socket outlets is 2.

Determination of Ratings of MAIN Switch and Distribution board:

Main switch - current rating - total current of circuit to be controlled.

Distribution board - Each sub circuit - current of the ^{each} sub circuit can be calculated.

Determination of Size of Conductors:

(i) Minimum size of the cable for mechanical strength.

↳ used in domestic not be of size less than
1/1.12 mm in Cu (or) 1/1.40 mm (1.5 mm²) in Al.

↳ for flexible cords and cables - 14 / 0.193 mm.

(ii) Current carrying capacity:

↳ wire (or) cable should of size sufficient to carry the current continuously without any overheating.

(iii) Voltage drop:

↳ Supply to point allowable 2%
+
one with light load
+
5% of supply for declared power wiring.

→ from table 8.3 (Ambient temp. of 30°C).