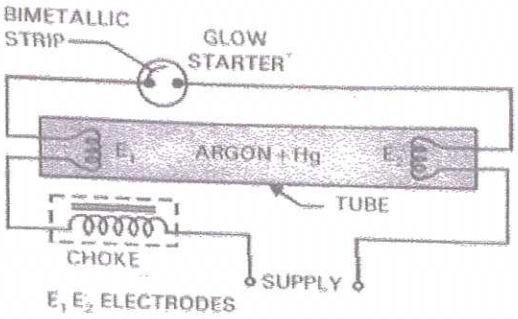
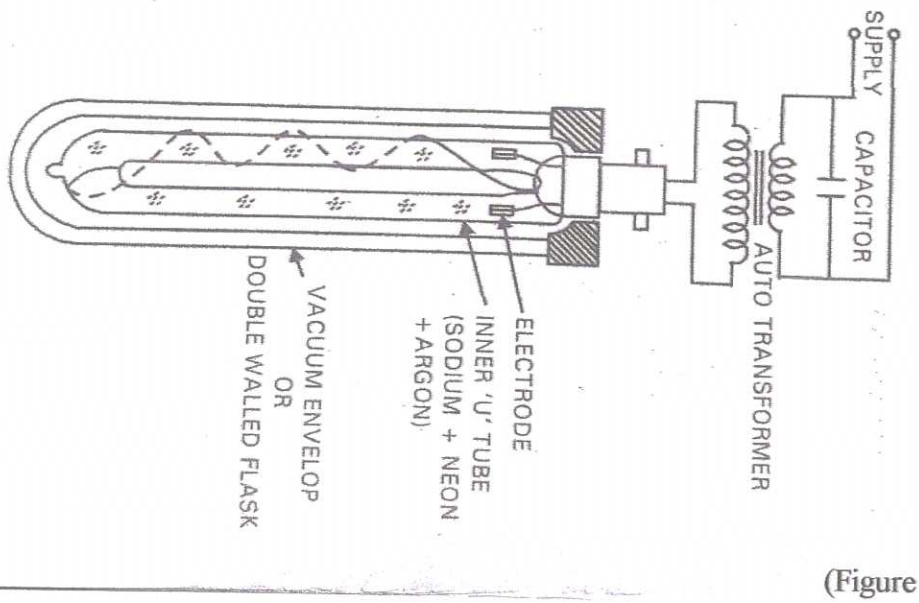
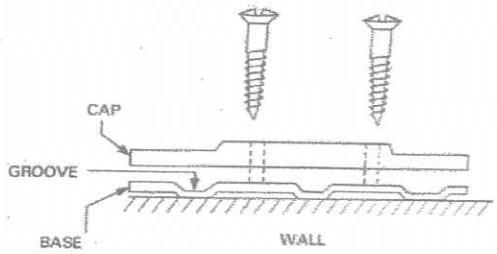
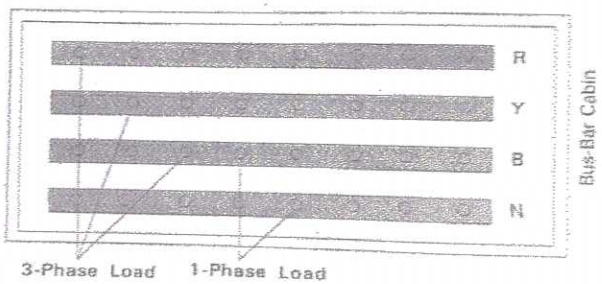
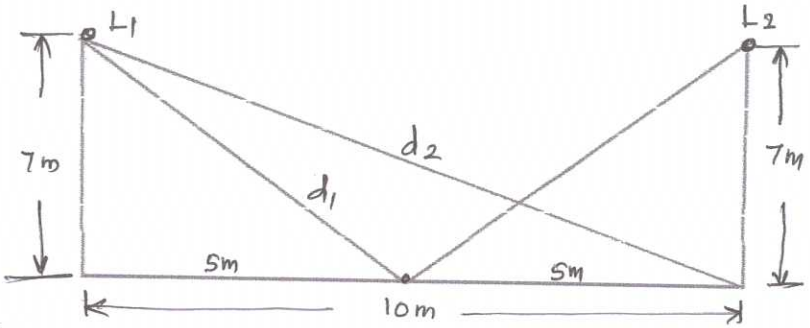
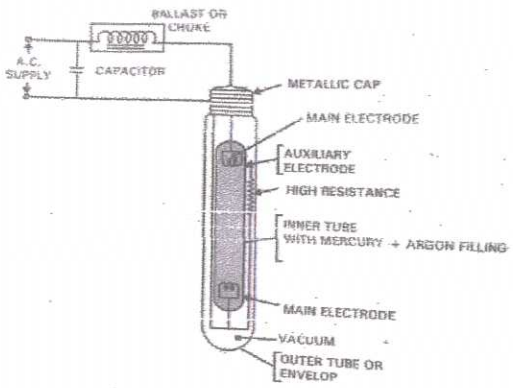
4033(15)

ELECTRICAL ESTIMATING AND COSTING 4033(15)

Version **F.**

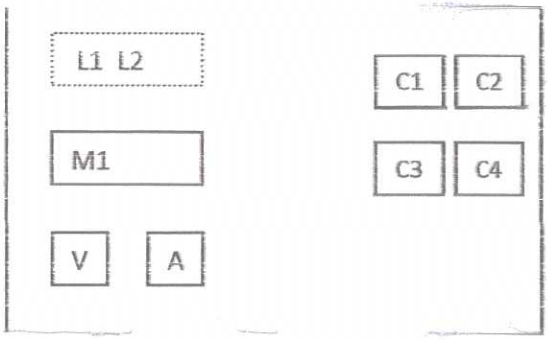
Qn. No	Scoring indicators	Split score	Total score
I			
1.	It states that the illumination of a surface is inversely proportional to the square of the distance between the surface and light source provided, the light source is a point source		2
2.	The MHCP of a lamp is the average candle power in the horizontal plane passing through the luminous centre of the lamp		2
3.	Clearance from buildings of high and extra high voltage lines		2
4.	Rod earthing, Strip earthing, Pipe earthing, Plate earthing		2
5.	Between conductor and structure is 1.3m		2
II			
1.	When connected to supply, full voltage appears across the starter terminals due to low resistance of the electrodes and small current through choke. As the starter is filled with argon gas, it ionises and a glow appears inside the starter. This glow warms up the bimettalic strip and short - circuits the starter teriminals. this causes maximum current through the electrodes and choke. thus results in thermionic emission at electrodes and ionises the argon gas inside the tube.	3	
		3	6
2.	 (Figure 3 Parts 3)		6

Qn. No	Scoring indicators	Split score	Total score
3.	In this system of wiring cables are supported and gripped between porcelain cleats above the wall or roof. The porcelain cleats are made in two halves. The main part is base, which is grooved to accommodate the cables, the other part is the cap whichis put over the base. The lower cleat and upper cover , after placing cables between them are then screwed on wodden gutties.  	3	
		3	6
4.	All the switches and starters should be accessible to the operator No switch or fuse is used in earth or neutral conductor Every sub-circuit should be connected with the fuse distribution board All metal coverings used for the protection of earth must be connected to earth Every live wire/line should be protected by a fuse of suitable rating as per load requirements Every appartus should be provided with a separate switch In any building light wiring and power wiring should be kept separately (any six)		6
5.	When the load is high (in industries or workshops or laboratories) therefore the load is distributed to different sub-circuits via busbars. Usually 3f loads will be taken directly but 1ϕ loads will be distributed among all the 3phases equally. The buses are made of copper or aluminium strips with nut and bolt facility for tapping the loads. Design depends on the load of the industry.  	3	
		3	6
6.	Quantity of coal and salt Material of the electrode Moisture content of the soil Temperature of the soil Soil condition Size of the earth electrode Quality of coal and salt Depth of the electrode embedded below the ground level (any six)		6

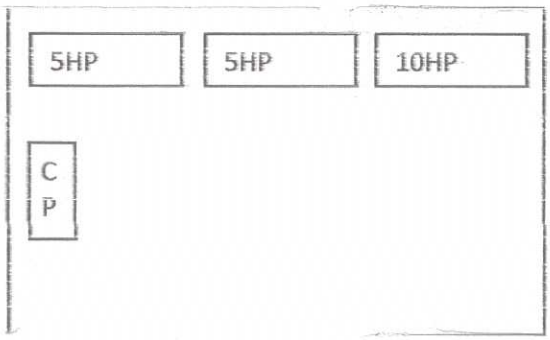
Qn. No	Scoring indicators	Split score	Total score
7.	Supports Insulators Lightning arresters Guard lines Conductors Guys and stays Cross arms and clamps (any four with explanation)		6
III a	 d1= 8.6m d2= 12.2m Cos ϕ1= 0.813 Cos ϕ2= 0.573 Illumination at c due to L1= 8.79 Lux Illumination at c due to L2= 8.79 Lux Total at C due to L1 & L2= 17.58 Lux Illumination at b due to L1= 3.079 Lux Illumination at b due to L2= 16.32 Lux Total at B due to L1 & L2= 19.4 Lux	1 1 1 1 1 1 1 1	8
b	 When the lamp is switched on the voltage appears across the auxiliary electrode and nearly main electrode. The argon gas between these two electrodes is first ionised because of small distance between them and an arc takes place between them. The small arc flow results in building up of pressure due to warming or heating of mecury which is originally in the condenced form. Ultimately the discharge take place between the two main electrodes, Due to low resistance of the ionised path between the two main electrodes the discharge shifts from auxiliary electrode circuit to main electrodes.		7

Qn. No	Scoring indicators	Split score	Total score
IV			
a.	1.Utilization factor : The ratio of total lumens received on the working plane to the total lume emitted by the light source	2	
	2.Maintenance factor : The ratio of illumination under normal working condition to the illumination when every thing is clean or new.	2	
	3.Space height ratio : The ratio of the horizontal distance between the lamps to the mounting height of the lamps above working plane	2	
	4.Luminous efficiency : The ratio of luminous flux emitted to the electric power in take of a source	2	8
b.	Room area = $80m^2$	1	
	Total wattage = 640W	1	
	Total flux radiated by 8 lamps = 1600 lumens	1	
	Flux reaching the working plane = 7200 lumens	2	
	Illumination = 90Lux	2	7
VI			
a.	Light circuit — No. of sub- circuits		
	Fan 80W 6 Nos = 480W		
	5A socket 100W 4 Nos = 400W		
	Refrigerator 300W		
	Lamps 60W 7 Nos = 420W		
	Total = 1600W		
	No. of sub-circuit= 1600/800 — 2		
	Power circuit		
	Pump motor = 1No — 1		
	Induction cooker = 1No — 1		
	TOTAL — 4 Nos.		8
b.	Conduit wiring two types		
	Concealed conduit wiring	1.5	
	Surface conduit wiring	1.5	
	Explanation (2 + 2)	4	7

Qn. No	Scoring indicators	Split score	Total score
VII			



Control panel



M1 to M3 Motors

a) Current drawn by 10HP motor

Full-load current of the motor (I_L) = Rating/$\sqrt{3}$VLCos ϕ η **(12.61A)**

Starting Current = 2 x12.61 = 25.23A

b) Current drawn by 5HP motor

Full-load current of the motor (I_L) = Rating/$\sqrt{3}$VLCos ϕ η **(6.31A)**

Starting Current = 2 x12.61 = 12.62A

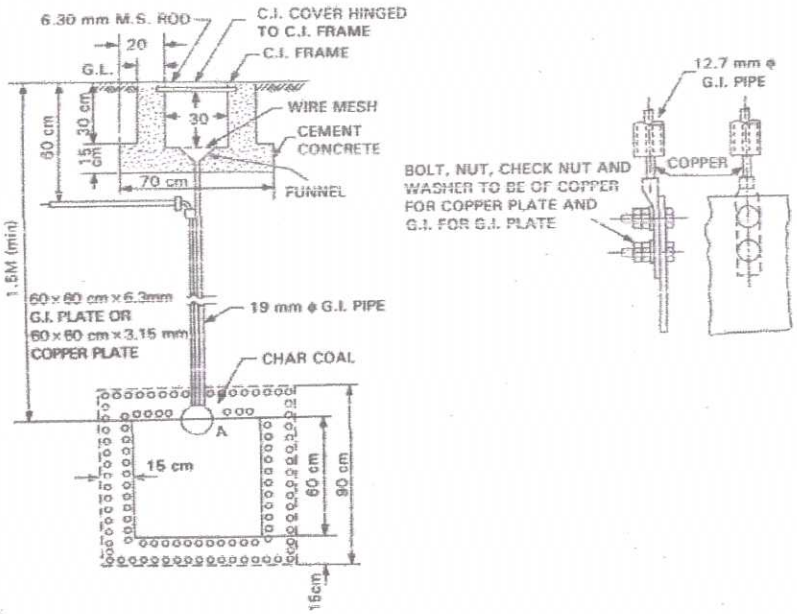
c) Total Current of the main control = 12.61 x 1 + 6.31 x 2 = 25.23A

d) Starting current of main control = 2 x 12.61 + 6.31 + 6.31 = 37.84A

e) Estimate of material and cost

SL. No.	Specification	Quantity	Rate	Cost	Remarks
1	64A, 415V, ICTP	1No	800	800	
2	32A, 415V, ICTP	1 No	750	750	
3	16A, 415V, ICTP	2Nos	700	1400	
4	Voltmeter (0-600V)	1No	500	500	
5	Ammeter (0-100A)	1No	500	500	
6	Lamps 25W, 250V	3 Nos	10	30	

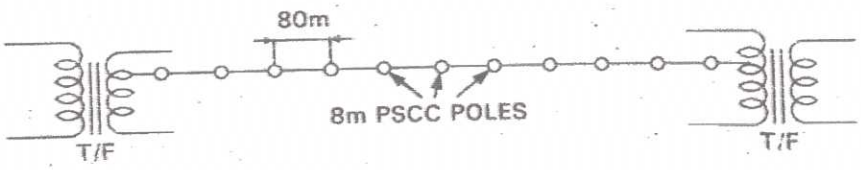
Qn. No	Scoring indicators						Split score	Total score
	7	Batten lamp holder	.	10	30			
	8	Switches 6A, 250V	3Nos	10	30			
	9	copper VIR wire	100m	12	1200			
	10	copper VIR wire	80m	12	960			
	11	Labour charge	-	-	1500			
				Grand total	7,700	Say Rs. 8,000/-		15

Qn. No	Scoring indicators	Split score	Total score
VIII		6	

Estimate of material

SL. No.	Specification	Quantity	Rate	Cost	Remarks
1	G.I. plate 60cm x 60cm x 6.30mm (Copper plate 60cm x 60cm x 3.15mm)	1No			Earth electrode
2	GI wire (8SWG)	4m			
3	12.7mm GI pipe	2m			
4	19mm GI pipe	1.5m			
5	G.I nuts, bolts, check nut and washers	6sets			
6	G.I bend 12.7m	1No.			
7	G.I lugs	3No.			For connecting earth wire
8	Cast iron frame with hinges 30 x 30cm	1No.			

Qn. No	Scoring indicators					Split score	Total score
	9	Cast iron cover 30 x 30cm	1No.				
	10	Funnel with wire mesh	1No.				
	11	Charcoal or coke	20kg				
	12	Salt	20kg				
	13	Cement concrete	Lump Sum.				
	14	Caution plate painted	1No.			9	15
IX						3	



Solution :

No. of spans 1000/60 = 16.6 = 17 Nos.

No, of poles = No. of spans + 1 = 17 + 1 = 18 Nos.

Length of conductor 3 x 1000 = 3000 m

Wastage = 150 m

Total 3150 m

Cross arms (1.52m x 75 mm x 37mm MS) = 18 Nos.

Insulators

HT Pin type 16 x 3 = 48

HT Disc type 2 x 3 = 6

Qn. No	Scoring indicators						Split score	Total score
	Estimate of material and cost							
	SL. No.	Specification	Quantity	Rate	Cost	Remarks		
	1	PSCC poles 9m long	18 Nos	2500	45000			
	2	AAC 7/2.59 conductor	3150 m	120/kg	189000	2m = 1kg		
	3	HT Pin insulator	48Nos	300	14400			
	4	insulator	6Nos	350	2100			
	5	M.S. cross arms 1.52m x 75mm x 37mm	18 Nos	100/kg	5400	1 cross arm = 3kg		
	6	Earth set	3 Nos	500	1500	For every 5th pole		
	7	Stay sets including guy insulator and clamps	4 Nos	1200	4800	For every 4th pole		
	8	Danger plates	14 Nos	25	125			
	9	Cement	L.S		500			
	10	Sand	L.S		500			
	11	Concrete (40mm)	20bags	30	600			
	12	Binding wire (Aluminium)	2kg	120	240			
	13	M.S. flat for cross arm fixing	18Nos	100/kg	900	Each 500gm		
	14	Barbed wire(Anticlimbing device)	25kg	50/kg	1250			
	15	11KV Lightning arresters	6Nos	1500	9000			
	16	Cradle guard	1No	2500	2500			
	21	Labour charges	-	-	37500			
	Total Cost				3,15,315	Say Rs.3,15,500/-	12	15

Qn. No	Scoring indicators	Split score	Total score
X	Solution : Assume : 1. Tapping from existing pole 2. Take span as 50m 3. Cable laying along the road side 4. Considering one joint/90m 5. 4 ½ core lead sheathed cable <u>Conductor:</u> 4 ½ core lead sheathed cable is suitable (10% wastage)		

Estimate of material and cost

SL. No.	Specification	Quantity	Rate	Cost
1	PSCC poles 8m long	6 Nos	2000	12,000
2	4 ½ core lead sheathed cable	310 m	3000/m	9,30,000
3	Cement bricks 30 x 15 x 12cm	6000Nos	15/No	90,000
4	Cable joints	8	10,000/joint	80,000
5	Street lighting with reflectors	6 Nos	1000	6,000
6	Cement	50 bags	650/bag	32,500
7	Sand	5 trucks	20,000	1,00,000
8	Labour charges including digging channel	-	-	50,000
Total Cost				1,300,500

			15