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Apr.25

P_10

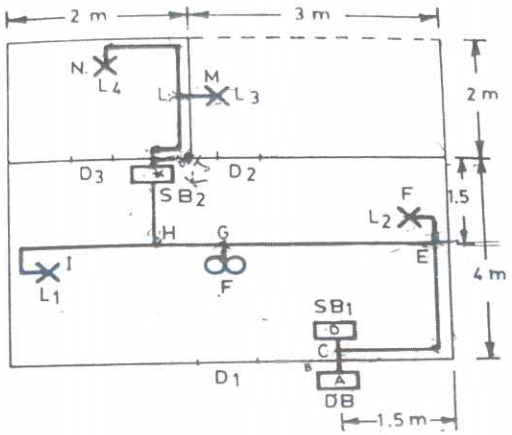
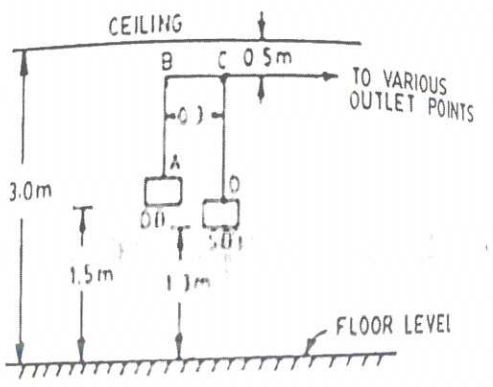
SCORING INDICATOR

COURSE NAME: ELECTRICAL INSTALLATION DESIGN &ESTIMATION

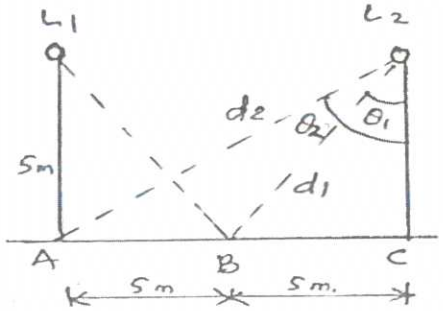
COURSE CODE:4032 **QID:**2103230084

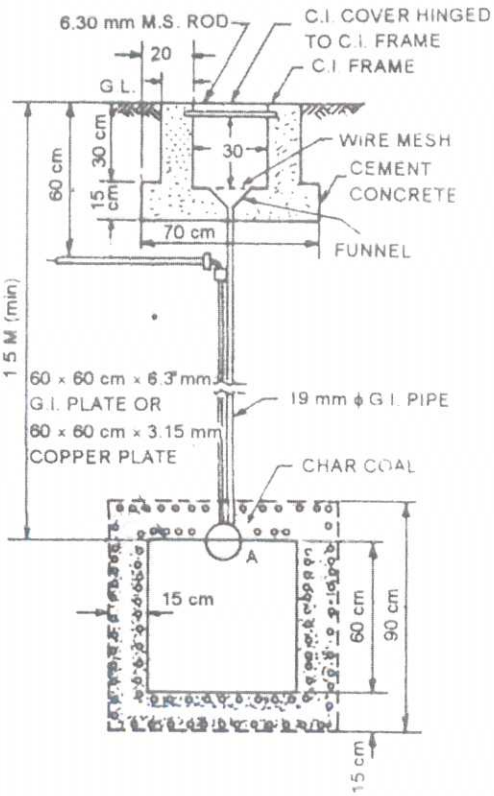
Q NO	SCORING INDICATOR	Split score	Sub Total	Total Score
I	**PART A**			
1	1. The conductor used is to be of such a size that it may carry load current safely. 2. Every sub-circuit is to be connected to a distribution fuse board. 3. Every line (phase or positive) is to be protected by a fuse of suitable rating as per requirements. 4. All the switches and starters are accessible to the operator.	Any 3 points	1*3	3 marks
2	(a) X (b) ∞ (c)	1 mark	1*3	3 marks
3	1. Inverse Square Law It states that the illumination of a surface is inversely proportional to the square of the distance between the surface and the light source. 2. Lambert's Cosine Law It states that the illumination E at any point on a surface is directly proportional to the cosine of the angle between the normal at that point and the line of flux.		1.5*2	3 marks
4	1. size of the room 2. Height of the light above work area 3. Reflective capacity of wall and surfaces 4. Condition of light surface (dust free)	Any 3 points	1*3	3 marks

	5. Atmosphere in the room (smoke, fume, dust.) 6. Type of light 7. Colour of the ceiling of walls			
5	• To ensure that no current carrying conductor rises to a potential with respect to general mass of earth than its designed insulation • To avoid electric shock • To avoid risk of fire due to earth leakage current through unwanted path	Any 3 points	1*3	3 marks
6	To reduce the heavy starting current drawn by the motor. To provide overload and undervoltage protection for the motor. To ensure smooth and safe startup of the motor.	3	3	3 marks
7	1. Supports. Poles or towers depending upon the working voltage and the region where these are used. The function of the line support is obviously to support the conductors so as to keep them at a suitable level above the ground. 2. Cross arms and Clamps. These are either of wood or steel angle section and are used on pole structures to support the insulators and conductors. 3. Insulators. Pin, strain or suspension types, as the case may be, for supporting the conductors and taking strain or suspending the conductors respectively. 4. Conductors. Copper, aluminium or ACSR or of any other composition depending upon the current to be carried and the span of the line. 5. Guys and Stays. Braces or cables are fastened to the pole at the termination or angle poles to resist lateral forces. 6.Lightning Arrestors. to discharge excessive voltages built upon the line, to earth, due to lightning. 7. Fuses and Isolating Switches to isolate different parts of the overhead system.	Any 3 points	1*3	3 marks

II	PART B			
II	(a)Number of sub circuits	4 marks		7
	4*60+1*100=340 watts			
	Since the number of outlets is 5 and the total load is 340watts. Only one sub circuit is required.			
		3 marks		
	(b) Size and length of wire			
	Current flowing through the sub circuit =340W/240V~1.4A	2 marks		
	Therefore the minimum size of wire as generally used in a sub circuit.(1 sq mm copper)	1 mark		
	Length of the wire	Assumptions 2 marks		8
				
	Total Length of conduit =25m(appx)	2 marks		
	Total length of wire =80m(appx)	1 marks		

III	Light and fan sub circuit Fans 80W ,6 Nos =480W 5A socket 100W,4 Nos=400W Refrigerator 100W,4Nos=400W Lamp 60W,7Nos =420W No of sub circuit=1700/800 ~3 sub circuits Power sub circuit Motor 1 No Induction cooker -1No. No of sub circuit 2 Total no of sub circuits 5 Selection of main switch (3 marks) Selection of main switch (1 marks)	6 marks 4 Marks 1 mark		15
IV (a)	Intensity of illumination E=50Lux Working area A =12m*9m Number of lamps =36 Coefficient of utilization CU =0.5 Maintenance factor =1 Lumen value of lamp O $=\frac{E*A}{N*CU*MF}$ =300 lumens	7		

	Power of the lamp in candela=300/4=24cd			
(b)	Number of lamps required $N = \frac{E \times A}{\phi \times \omega \times MF}$ $= \frac{200*30*15}{2700*0.6*0.8}$ $=70$	8		15
V	 d_1=7.07 d_2 =11.18 Cos θ1=0.707 Cos θ2=0.447 illumination at B due to L1=L2=4.24 Lux illuminations at B due to L1&L2=8.48 Lux illumination at A due to L1 =12 Lux illumination at A due to L1 =1.07 Lux illumination at A due to L1 &L2 =13.07Lux	3 marks 4 marks 4 marks. 4 marks		15

VI		8		15

1	GI plate 60cmX60cmX6.3mm					
2	GI wire (8SWG)					
3	12.7mm GI pipe					
4	19mm GI pipe					
5	GI nut,bolt, washers, checknut	6 sets				
6	GI bend 12.7mm					
7	GI lugs					
8	Cast iron frame with hinges					
9	Cast iron cover 30cmX30cm					
10	Funnel with wire mesh					
11	Charcol or cock	20kg				
12	Salt	20kg				
13	Cement					
14	Caution plate					

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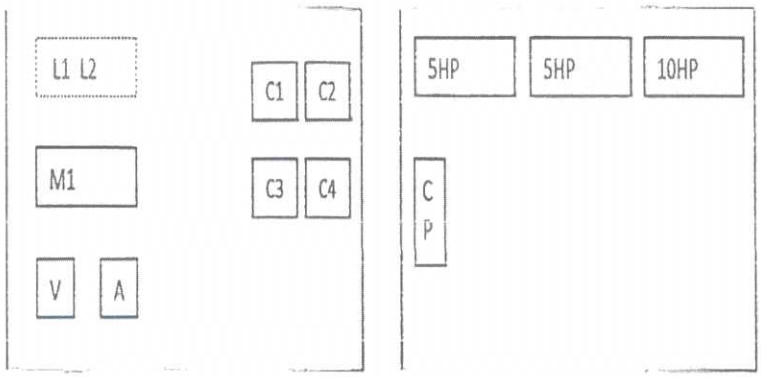
VII



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i) 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

ii) 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

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

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

Estimation of materials

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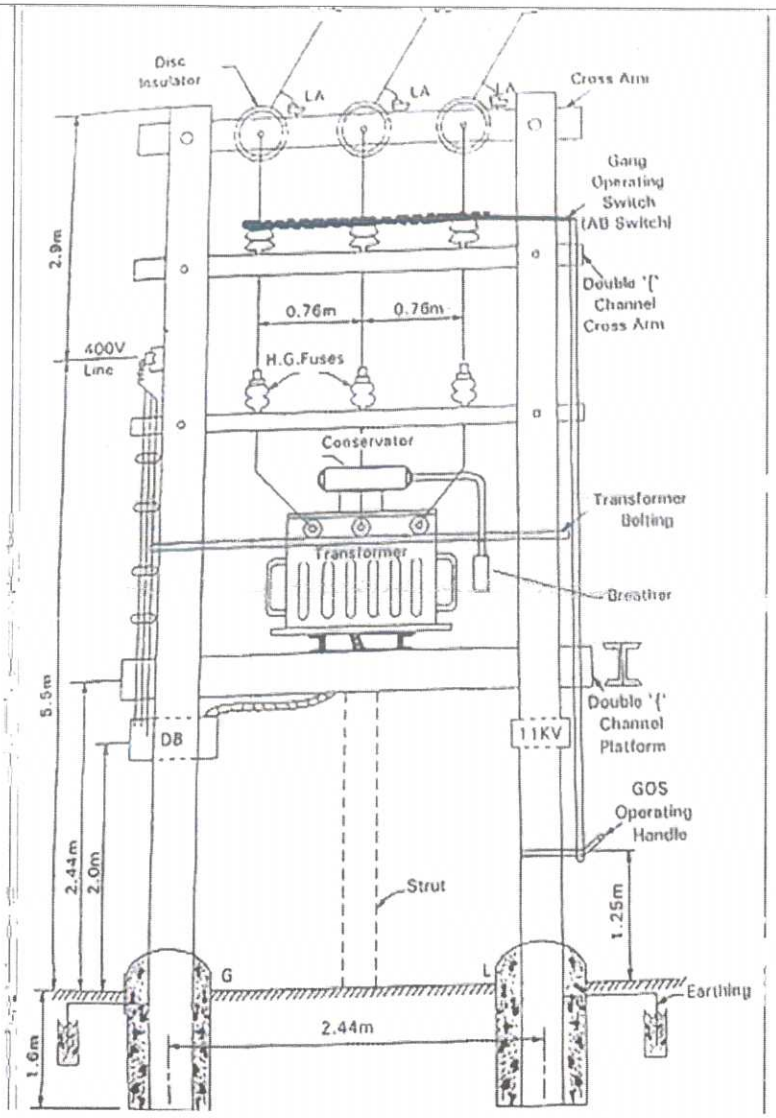
SL. No.	Specification	Quantity
1	64A, 415V, ICTP	1No
2	32A, 415V, ICTP	1 No
3	16A, 415V, ICTP	2Nos
4	Voltmeter (0-600V)	1No
5	Ammeter (0-100A)	1No
6	Lamps 25W, 250V	3 Nos

	7	Batten lamp holder	-			
	8	Switches 6A, 250V	3Nos			
	9	copper VIR wire	100m			
	10	copper VIR wire	80m			
	11	Labour charge	-			
VIII			8			15

Sl no.	Description of material with specification	Quantity Required	
		Qty	unit
1	PCC poles 11 m long	2	No
2	11 kV disc insulators	3	No
3	Lightning arrestor (1 set of 3)	1	Set
4	Gang operating switch	1	Set
5	11 kV DO fuse unit(Drop out)	1	,,
6	250 kVA, 11/440 V 3 phase 4 wire 50 Hz outdoor type T/F with complete accessories and oil filled	1	No
7	MS angle iron 50mm × 50 mm × 6mm	6	No
8	MS channel iron 100mm × 50mm × 6 mm	2	No
9	400A, 500 V, ICTPN switch with rewirable type porcelain Fuses (complete set)	1	No
10	ACSR conductor 7/2.11 mm	15	M
11	Single core VIR cable 95mm^2	20	M
12	19/ 1.63 mm single core VIR cable	7	M
13	Clamps	6	No
14	Earthing set	4	No
15	Stay set with insulation	2	No
16	Barbed wire	10	Kg
17	Danger plates with clamps	2	No
18	Nuts and bolts	Lump sum	
19	Cement	4	Sack
20	Sand	4	,,
21	Pebbles	4	

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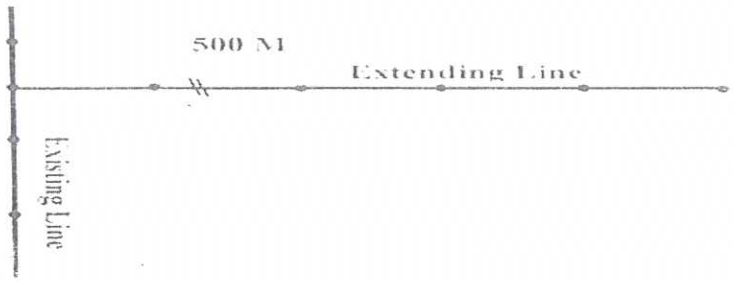
IX	Number of poles = $\frac{500}{100} = 5$ Length of conductor = 2 X 500 + 5% sag and wastage = 1050m Insulators Pintype = 4x2=8, disc type = 2x2=4 Cross arms 5+1 = 6	4		15
		8		
		3		

Material	Qty
PSCC 9 m long poles	5
AAC conductor	1050m
Pin insulators	8
Disc insulators	2
MS cross arm	6
Earth set	2
Stay set	3
Danger plates	5
Cement	10 bag
Concrete	20 bags
Sand	2 tons
Binding wire	2kg
MS flat for cross arm fixing	6
Nut and bolts	50kg
Labour charges