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EEE Dept. | Exam. | Internal Assessment | Even Sem(2017-18)

FIRST INTERNAL ASSESSMENT

Sem :IV **Sub: Transmission and Distribution** **Sub. Code: 15EE43**

Date:06/03/2018 **Time:11:00AM-12.00 Noon** **Max. Marks: 25**

Note: Answer two full questions, draw sketches wherever necessary.

Q.N		Discription of Question	M	CO	RBT L
1	a	An overhead three phase short transmission line delivers 5MW at 22kV at 0.8 p.f lagging. The resistance and reactance of each conductor is 4 ohm and 6 ohm respectively. Draw the phasor diagram and Determine , Sending end voltage, Sending end p.f, percentage regulation, transmission efficiency .	8	CO211.1	L3
	b	Write a brief note on Short transmission line.	5	CO211.1	L3
		OR			
2	a	A three phase, 50Hz, 150km line has a resistance, inductive reactance and capacitive shunt admittance of 0.1 ohm, 0.5 ohm and 3×10^{-6} siemens per km per phase respectively. If the line delivers 50MW at 110kV and 0.8 p.f lagging, determine the sending end voltage, sending end current, sending end p.f, percentage regulation and efficiency. Assume a nominal-π circuit for the line. Draw relevant phasor diagram.	8	CO211.1	L3
	b	Write a brief note on medium transmission line.	5	CO211.1	L3
3	a	Derive an expression for sending end voltage and current for a medium transmission line using nominal-pi method.	8	CO211.1	L3
	b	Determine A, B, C, D constants of a short transmission line.	4	CO211.1	L3
		OR			
4	a	Derive an expression for sending end voltage and current for a medium transmission line using nominal-T method.	8	CO211.1	L3
	b	Determine A, B, C, D constants of a long transmission line.	4	CO211.1	L3

Course Coordinator **Module Coordinator** **HOD**

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FIRST INTERNAL ASSESSMENT

Sem :IV Sub: Transmission and Distribution Sub. Code: 15EE43

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	b	Write a brief note on Short transmission line.	5	CO211.1	L3
		OR			
2	a	A three phase, 50Hz, 150km line has a resistance, inductive reactance and capacitive shunt admittance of 0.1 ohm, 0.5 ohm and 3×10^{-6} siemens per km per phase respectively. If the line delivers 50MW at 110kV and 0.8 p.f lagging, determine the sending end voltage, sending end current, sending end p.f, percentage regulation and efficiency. Assume a nominal-π circuit for the line. Draw relevant phasor diagram.	8	CO211.1	L3
	b	Write a brief note on medium transmission line.	5	CO211.1	L3
3	a	Derive an expression for sending end voltage and current for a medium transmission line using nominal-pi method.	8	CO211.1	L3
	b	Determine A, B, C, D constants of a short transmission line.	4	CO211.1	L3
		OR			
4	a	Derive an expression for sending end voltage and current for a medium transmission line using nominal-T method.	8	CO211.1	L3
	b	Determine A, B, C, D constants of a long transmission line.	4	CO211.1	L3

Course Coordinator Module Coordinator HOD

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E&E Engg Dept
Exam
IA Scheme
2017-18 Even Sem

Page. No.: 1

IA-1

SCHEME OF EVALUATION

Sem : 7th | Subject : TD | Sub Code : 15EE43 | Date : 6/3/18

Q. No.	Bit	Description	Marks	CO's
1	a	Drawing relevant phasor diagram: $V_R = 12701$, $I_R = 164\text{A}$, $\vec{I}_R = 131.23 - j98.4$	1M	
		Sending end voltage $\vec{V}_S = 13815.2 + j39.3$		
		$= 13815.78 \angle 0.17°$		
		$V_{S_{ph}} = 13820.8$ volts	2M	
		$V_{S_{line}} = \sqrt{3} \times 13820.8 = 23.938$ KV		
		Sending end pf $\cos\phi_S = \cos(36.86 + 1.632)$	1M	
		$= 0.7827$ lag		
		% reg $= \frac{13820.8 - 12700}{12700} \times 100 = 8.825$ %	2M	
		% eff $= \frac{50000 \times 10^3}{50000 + 164^2 \times 4} = 93.94$ % / 97.89 %	2M	
			8M	
1	b	Properly writing on Short Transmission line	5M	
		OR		
2	a	Drawing phasor diagram	1M	
		$I = 328$ A, $V_R = 63508$ V, $R = 15\Omega$, $X_C = 75\Omega$, $Y = 45 \times 10^{-5}$ ℧, $\vec{I}_R = 328 \angle -36.86$		
		$\vec{V}_S = 81131 + j16942.5$	2M	
		$= 82881 \angle 11.47$ Volts		
		$V_{S_{phase}} = 82881$		
		$V_{S_{line}} = \sqrt{3} \times 82881 = 143550 = 143.55$ KV	2M	
		$\vec{I}_S = 258.6 - j164.25$ Amps		
		$= 306.4 \angle -32.4°$ Amps	1M	
		$\cos\phi_S = \cos(11.47 + 32.4)$		
		$= 0.7209$ lag		

Course Coordinator

Module Coordinator

HOD

SCHEME OF EVALUATION

Sem : 4th | Subject : TD | Sub Code : 15EE43 | Date : 6/3/18

Q. No.	Bit	Description	Marks	CO's
		% reg $= \frac{82881 - 63508}{63508} = 30.50$	1m	
		% eff $= \frac{50\times10^6}{50\times10^6 + (3\times 319.62^2\times 15)} \times 100$	1m	
		$= 91.50$	8m	
2	b	Briefly writing Note on Medium Transmission line	5M	
3	a	Expression for $\vec{V_S}$ & $\vec{I_S}$ for Medium Nominal π Transmission line with relevant phasor diagram	8m	
3	b	ABCD Parameters of short t.l. line $\vec{A}=1$, $\vec{B}=\vec{Z}$, $C=0$ & $\vec{D}=1$	1 each 1×4 4m	
		OR		
4	a	Expression for $\vec{V_S}$ and $\vec{I_S}$ for Nominal T method with relevant phasor diagram	8m	
4	b	ABCD Parameters - long t.l lines $\vec{A} = \vec{D} = \cosh\sqrt{YZ}$ $\vec{B} = \sqrt{Z/Y}\sinh\sqrt{YZ}$ $\vec{C} = \sqrt{Y/Z}\sinh\sqrt{YZ}$	1 each 1×4 4m	

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SECOND INTERNAL ASSESSMENT

Sem :IV **Sub: Transmission and Distribution** **Sub. Code: 15EE43**

Date:12/04/2018 **Time:11:00AM-12.00 Noon** **Max. Marks: 25**

Note: Answer two full questions, draw sketches wherever necessary.

Q.N		Discription of Question	M	CO	RBT L
1	a	Derive an expression for sag for the supports are at equal level.	8	CO211.2	L2
	b	Explain in brief typical transmission distribution system scheme with neat diagram.	5	CO211.2	L2
		OR			
2	a	Derive an expression for sag for the supports are at unequal level.	8	CO211.2	L2
	b	The towers of height 30m and 90m respectively support a transmission line conductor at water crossing. The horizontal distance between the towers is 500m. If the tension in the conductor is 1600kg, find the minimum clearance of the conductor and water. Weight of the conductor is 1.5kg/m. Bases of the towers can be considered at water level.	5	CO211.2	L2
3	a	Derive expressions for the potential distribution over string of suspension type of insulators.	8	CO211.2	L2
	b	Define string efficiency and write its importance.	4	CO211.2	L2
		OR			
4	a	What are the different types of insulators available? Explain with diagrams.	8	CO211.2	L2
	b	Explain any two methods to improve string efficiency.	4	CO211.2	L2

Course Coordinator **Module Coordinator** **HOD**

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SECOND INTERNAL ASSESSMENT

Sem :IV Sub: Transmission and Distribution Sub. Code: 15EE43

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Note: Answer two full questions, draw sketches wherever necessary.

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1	a	Derive an expression for sag for the supports are at equal level.	8	CO211.2	L2
	b	Explain in brief typical transmission distribution system scheme with neat diagram.	5	CO211.2	L2
		OR			
2	a	Derive an expression for sag for the supports are at unequal level.	8	CO211.2	L2
	b	The towers of height 30m and 90m respectively support a transmission line conductor at water crossing. The horizontal distance between the towers is 500m. If the tension in the conductor is 1600kg, find the minimum clearance of the conductor and water. Weight of the conductor is 1.5kg/m. Bases of the towers can be considered at water level.	5	CO211.2	L2
3	a	Derive expressions for the potential distribution over string of suspension type of insulators.	8	CO211.2	L2
	b	Define string efficiency and write its importance.	4	CO211.2	L2
		OR			
4	a	What are the different types of insulators available? Explain with diagrams.	8	CO211.2	L2
	b	Explain any two methods to improve string efficiency.	4	CO211.2	L2

Course Coordinator Module Coordinator HOD

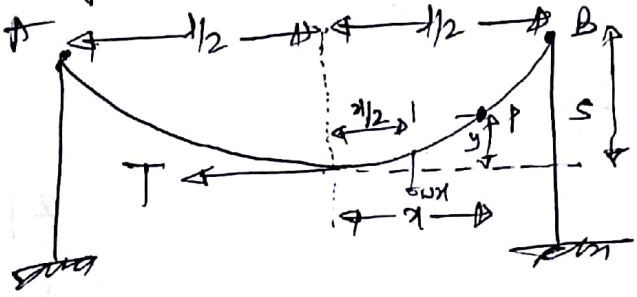
IA-2

SCHEME OF EVALUATION

Sem: 4 | Subject: TD | Sub Code: 15EE42 | Date: 12/04/18

Q. No.	Bit	Description	Marks	CO's

Q1 a Sag at equal level



$T_y = W x \times x/2$

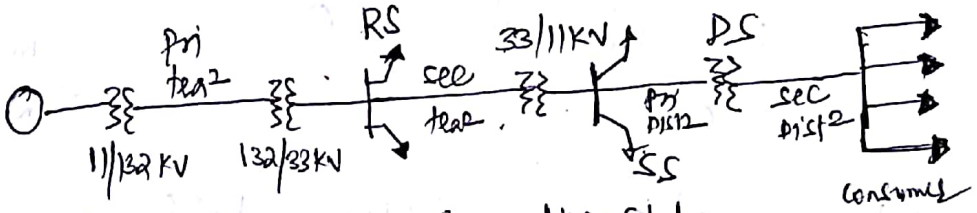
$y = \frac{Wx^2}{2T}$

$x = l/2,\ y = S$

$Sag = S = \frac{Wl^2}{8T}$

dig 2M 1M 1M 1M 2M = 8M — CO 211.2

Q1 b

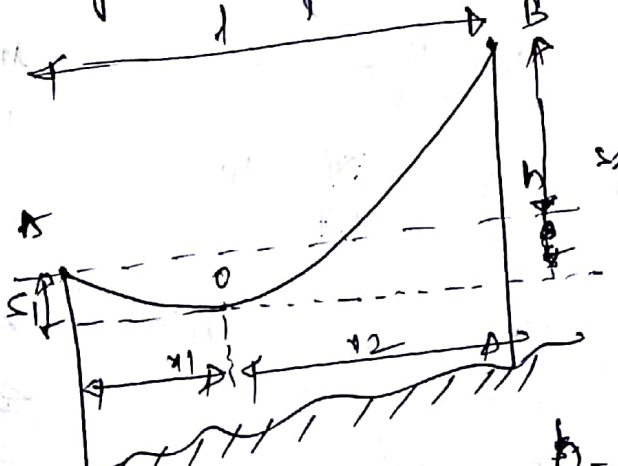


Brief Explanation
Generating station
Primary transmission
Sec transmission
Primary distribution
Secondary distribution

1M 1M 1M 1M 1M = 5M — CO 211.2

Q2 a Sag at unequal level of supports

dig 1M



$S_1 = \frac{Wx_1^2}{2T}$

$S_2 = \frac{Wx_2^2}{2T}$

$x_1 + x_2 = l$

$S_2 - S_1 = \frac{Wl}{2T}(x_2 - x_1)$

$S_2 - S_1 = h$

$h = \frac{Wl}{2T}(x_2 - x_1)$

$x_2 - x_1 = 2Th/Wl$

$x_1 = l/2 - Th/Wl$

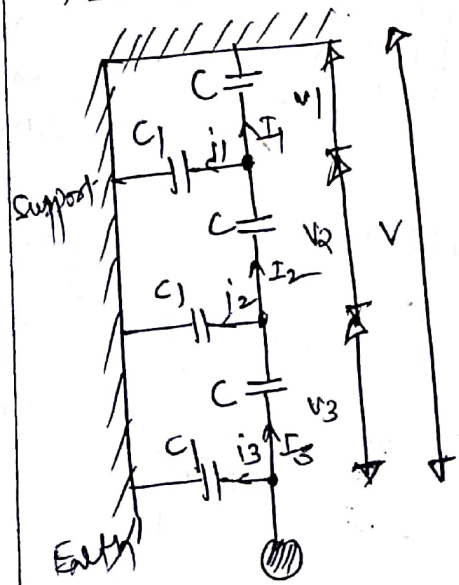
$x_2 = l/2 + Th/Wl$

1M 1M 1M 1M 1M 1M 1M = 8M

Course Coordinator | Module Coordinator | HOD

SCHEME OF EVALUATION

Sem : 4 | Subject : EE | Sub Code : 15EE43 | Date : 12/04/18

Q. No.	Bit	Description	Marks	CO's
Q2	b	$l = 500m$, $T = 1600kg$, $w = 1.5kg$, $b = 90-30 = 60m$		CO
		$x_1 + x_2 = 500m$	1M	2M, 2
		$S_1 = \frac{w x_1^2}{2T}$ $S_2 = \frac{w x_2^2}{2T}$		
		$x_2 - x_1 = 256m$	2M	
		$x_1 = 122m$, $x_2 = 378m$		
		$S_1 = 7m$, $S_2 = 67$	1M	
		clearance from water level from "O"		
		$= 30 - 7 = 23m$	1M	
			5M	
Q3	a	Potential distribution over suspension type insulator.	diagram 1M	
			1M	
			1M	
			1M	
			1M	
			1M	
			1M	
			1M	
			1M	
			1M	
Q3	b	importance of string efficiency (not less than 6 lines)	4M	CO2 1/2
Q4	a	Listing different insulators and diagrams	2M each	
			8M	
4	b	Any 2 methods to improve string efficiency	2M each	CO2 1.2
			4M	

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THIRD INTERNAL ASSESSMENT

Sem :IV **Sub: Transmission and Distribution** **Sub. Code: 15EE43**

Date:19/05/2018 **Time:11:00AM-12.00 Noon** **Max. Marks: 25**

Note: Answer two full questions, draw sketches wherever necessary.

Q.N		Discription of Question	M	CO	RBT L
1	a	Derive an expression for inductance of a 3-phase overhead line i)symmetrical spacing ii)unsymmetrical spacing.	8	CO211.2	L3
	b	Briefly explain the concept of self GMD and Mutual GMD.	5	CO211.2	L3
		OR			
2	a	Derive an expression for capacitance of a 3-phase overhead line i)symmetrical spacing ii)unsymmetrical spacing.	8	CO211.2	L3
	b	A three phase overhead transmission line has its conductors arranged at the corners of an equilateral triangle of 2m side. Calculate the capacitance of each line conductor per km. Given that diameter of each conductor is 1.25cm.	5	CO211.2	L3
3	a	Single phase ac distributor AB 300 meters long is fed from end A and is loaded as under, i)100A at 0.707 p.f lagging 200m from point A ii) 200A at 0.8pf lagging 300m from point A Calculate load resistance and reactance of the distributor is 0.2 ohm and 0.1 ohm per kilometer. Calculate the total voltage drop in the distributor. The load power factors refer to the voltage at the far end.	8	CO211.2	L4
	b	Explain primary ac distribution system briefly.	4	CO211.2	L4
		OR			
4	a	A single phase distributor 2km long supplies a load of 120A at 0.8pf lagging at its far end and a load of 80A at 0.9pf lagging at its mid point. Both power factors are referred to the voltage at the far end. The resistance and reactance per km(go and return) are 0.05 ohm and 0.1 ohm respectively. If the voltage at the far end is maintained at 230V, calculate i)voltage at the sending end ii)phase angle between voltages at the two ends.	8	CO211.2	L4
	b	Explain secondary ac distribution system briefly.	4	CO211.2	L4

Course Coordinator **Module Coordinator** **HOD**

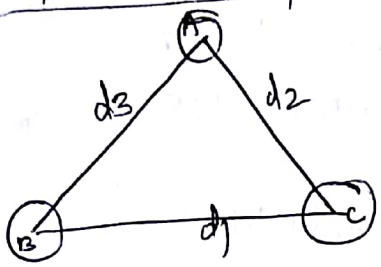
IA-3

SCHEME OF EVALUATION

Sem : 4 | Subject : TD | Sub Code : 15EE43 | Date : 19/05/18

Q. No.	Bit	Description	Marks	CO's
Q1	a	Expression for inductance 3φ off line		CO 2 | 1 | 2

i) Symmetrical Spacing



$$\psi_A = \frac{\mu_0}{2\pi}\left[\left(\frac{1}{4} - \log_e r'\right) I_A - I_B \log_e d_3 - I_C \log_e d_2\right]$$

$$\psi_A = \frac{\mu_0 I_A}{2\pi}\left[\frac{1}{4} + \log \frac{d}{r}\right] \frac{\text{weber turns}}{\text{m}}$$

$$L_A = \frac{\psi_A}{I_A} \text{ H/m} = \frac{\mu_0}{2\pi}\left[\frac{1}{4} + \log_e \frac{d}{r}\right] \text{ H/m}$$

$$L_A = 10^{-7}\left[0.5 + 2\log_e d/r\right] \text{ H/m}$$

4 m

ii) Unsymmetrical Spacing

$$\psi_A = \frac{\mu_0 I}{2\pi}\left[\frac{1}{4} + \log \frac{\sqrt{d_2 d_3}}{r} + j0.866 \log_e \frac{d_3}{d_2}\right]$$

$$L_A = \frac{\psi_A}{I_A} = \frac{\psi_A}{I} = \frac{\mu_0}{2\pi}\left[\frac{1}{4} + \log \frac{\sqrt{d_2 d_3}}{r} + j0.866 \log \frac{d_3}{d_2}\right]$$

$$= 10^{-7}\left[\frac{1}{2} + 2\log_e \frac{\sqrt{d_2 d_3}}{r} + j1.732 e^{-\frac{d_3}{d_2}}\right] \text{ H/m}$$

$$L_B = 10^{-7}\left[\frac{1}{2} + 2\log_e \frac{\sqrt{d_3 d_1}}{r} + j1.732 e^{-\frac{d_1}{d_3}}\right] \text{ H/m}$$

$$L_C = 10^{-7}\left[\frac{1}{2} + 2\log_e \sqrt{\frac{d_1 d_2}{r}} + j1.732 \log d_2/d_1\right] \text{ H/m}$$

Inductance of each line conductor

$$= 1/3\left[L_A + L_B + L_C\right]$$

$$= \left[0.5 + 2\log_e \sqrt[3]{\frac{d_1 d_2 d_3}{r}}\right] \times 10^{-7} \text{ H/m}$$

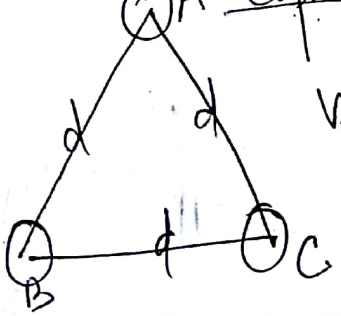
4 m

8 m

Course Coordinator | Module Coordinator | HOD

SCHEME OF EVALUATION

Sem : 4 | Subject : TD | Sub Code : 15EE43 | Date : 19/05/18

Q. No.	Bit	Description	Marks	CO's
Q1	b.	**Self GMD**		CO 2
		Inductance/Conductor/m $= 2\times10^{-7}\left[\frac{1}{4} + \log_e d/r\right]$		11.2
		$= 2\times10^{-7}\times\frac{1}{4} + 2\times10^{-7}\log_e d/r$		
		D_s = GMR or Self GMD $= 0.7788\,r$	1M	
		Mutual GMD		
		(a) D_m = spacing between Conductors $= d$		
		(b) $D_m = (d_1 d_2 d_3)^{1/3}$ for 3φ single ckt		
		(c) D_m for Double ckt		
		Self GMD of Conductor $= 0.7788\,r$		
		aa' $D_{s1} = (D_{aa}\times D_{aa'}\times D_{a'a}\times D_{a'a'})^{1/4}$		
		bb' $D_{s2} = (D_{bb}\times D_{bb'}\times D_{b'b'}\times D_{b'b})^{1/4}$		
		cc' $D_{s3} = (D_{cc}\times D_{cc'}\times D_{c'c'}\times D_{c'c})^{1/4}$		
		$D_s = (D_{s1}\times D_{s2}\times D_{s3})^{1/3}$		
		AB phase $D_{AB} = (D_{ab}\times D_{ab'}\times D_{a'b}\times D_{a'b'})^{1/4}$		
		BC phase $D_{BC} = (D_{bc}\times D_{bc'}\times D_{b'c}\times D_{b'c'})^{1/4}$	4M	
		CA phase $D_{CA} = (D_{ca}\times D_{ca'}\times D_{c'a}\times D_{c'a'})^{1/4}$		
		$D_m = (D_{AB}\times D_{BC}\times D_{CA})^{1/3}$	5M	
Q2	a	**Capacitance Calculation 3φ system**		CO 2
		Symmetrical Spacing		11.2
				
		$V_A = \frac{Q_A}{2\pi\varepsilon_0}\log_e d/r$ Volts		
		$C_A = \frac{Q_A}{V_A} = \frac{2\pi\varepsilon_0}{\log_e d/r}$ F/m	8M	

Course Coordinator | Module Coordinator | HOD

SCHEME OF EVALUATION

Sem : 4 | Subject : TD | Sub Code : 15EE43 | Date : 19/05/18

Q. No.	Bt	Description	Marks	CO's

Unsymmetrical Spacing

$Q_A + Q_B + Q_C = 0$

Positions

1, $V_1 = \frac{1}{2\pi\varepsilon_0}\left(Q_A \log \frac{1}{r} + Q_B \log \frac{1}{d_3} + Q_C \log \frac{1}{d_2}\right)$

2, $V_2 = \frac{1}{2\pi\varepsilon_0}\left(Q_A \log \frac{1}{r} + Q_B \log \frac{1}{d_2} + Q_C \log \frac{1}{d_3}\right)$

3, $V_3 = \frac{1}{2\pi\varepsilon_0}\left(Q_A \log \frac{1}{r} + Q_B \log \frac{1}{d_2} + Q_C \log \frac{1}{d_1}\right)$

Avg $V_A = \frac{1}{3}(V_1 + V_2 + V_3)$

$V_A = \frac{Q_A}{2\pi\varepsilon_0} \log \frac{(d_1 d_2 d_3)^{1/3}}{r}$ — 5M

$C_A = \frac{Q_A}{V_A} = \frac{2\pi\varepsilon_0}{\log \frac{\sqrt[3]{d_1 d_2 d_3}}{r}}$ F/m — 2M

Q2 b

$r = 0.625$ cm — 1M — CO 2 | 11.2

$d = 2m = 200$ cm — 1M

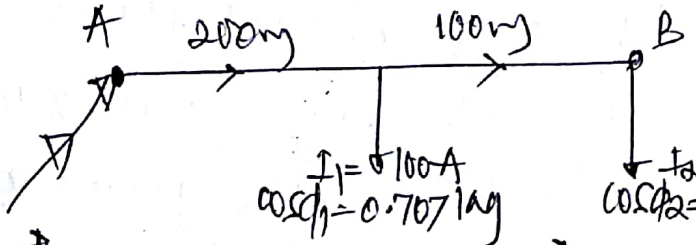
Capacitance of each line conductor — 3M

$\frac{2\pi\varepsilon_0}{\log_e d/r}$ F/m $= \frac{2\pi \times 8.854 \times 10^{-12}}{\log 200/0.625}$ F/m

$= 0.0096 \times 10^{-9}$ F/m $= 0.0096 \times 10^{-6}$ F/m — 5M

$C = 0.0096\ \mu$F

Q3 a



CO 2 | 11.2

$\vec{Z}_{AC} = 0.04 + j0.02\ \Omega$

$\vec{Z}_{CB} = 0.02 + j0.01\ \Omega$

$\vec{I}_2 = 200(160 - j120)$ A

$\vec{I}_1 = 70.7 - j70.7$ A

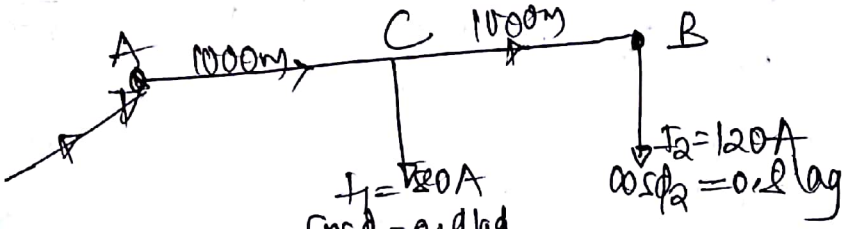
$\vec{I}_{CB} = \vec{I}_2 = (160 - j120)$ A — 4M

$\vec{I}_{AC} = (230.7 - j190.7)$ A

Course Coordinator | Module Coordinator | HOD

SCHEME OF EVALUATION

Sem : 4 | Subject : TD | Sub Code : 15EE43 | Date : 19/05/18

Q. No.	BR	Description	Marks	CO's
		$\vec{V_{CB}} = (4.4 - j0.8)$ V	2M	
		$\vec{V_{AC}} = (13.04 - j3.01)$ V		
		$\vec{V_{AC}} + \vec{V_{CB}} = 17.44 - j3.81$	2M	
		magnitude of voltage drop in distributor = 17.85 V		
3	b.	Radial feeder Brief explanation Primary ac distribution	1M each	CO 2
		Parallel feeder		1.2
		Loop feeder		
		Interconnected system	4M	
4	a			
		Impedance of distributor /km = $0.05 + j0.1\ \Omega$	4M	
		$\vec{Z_{AC}} = 0.05 + j0.1\ \Omega$		
		$\vec{Z_{CB}} = 0.05 + j0.1\ \Omega$		
		$\vec{V_B} = 230 + j0$		
		$\vec{I_2} = 96 - j72$ $\quad \vec{I_1} = 72 - j34.88$ A		
		$\vec{I_{EB}} = \vec{I_2} = 96 - j72$ A $\quad \vec{I_{AC}}$ / $(\vec{I_1} + \vec{I_2}) = 168 - j106.88$		
		$\vec{V_{CB}} = 12 + j6$ volts, $\vec{V_{AC}} = 19.08 + j11.45$ volts	2M	
		$\vec{V_A} = \vec{V_B} + \vec{V_{CB}} + \vec{V_{AC}} = 261.08 + j17.45$ volts	2M	
		VA mag = 261.07V		
		The phase angle $\tan\theta = \frac{17.45}{261.08} = 0.0668$ $\quad \theta = 3.83^\circ$	2M	
			4M	
4	b)	Brief Explanation Secondary AC distribution		

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