ROHINI COLLEGE OF ENGINEERING & TECHNOLOGY
Near Anjugramam Junction, Kanyakumari Main Road, Palkulam, Variyoor P.O - 629401
Kanyakumari Dist, Tamilnadu., E-mail : admin@rcet.org.in, Website : www.rcet.org.in

RCET/Staff Circular/August 2023 / D004

Date:25-08-2023

CIRCULAR

All the faculties are hereby informed that the first Internal Assessment Test (IAT I) for IV year shall commence from 30th of August to 5th of September 2023. The examination timing shall be from 09.30 a.m. to 11.00 a.m. The answer booklets and Question papers should be collected from the exam cell 20 minutes before the commencement of the examination and hand over the answer scripts to the exam cell as early as possible after the examination. You are informed to submit two set of Questions to the controller of Examination on or before 28-08-2022. Kindly adhere the following guidelines for the successful conduct of IAT-I.

1. The Question paper must be set confining to the prescribed syllabus (2 units) and in accordance with Bloom's Taxonomy.
2. Ensure that the Questions are neither ambiguous nor time consuming.
3. Verify that the Correct Course code, Course title, Duration, Max. Marks are written in the appropriate places on the Question Paper.
4. Mention specifically about Special Instructions such as Codes, Data Books, Charts, Tables, Drawing and Graph Sheets to be supplied or permitted in the box given above the Part A question.
5. Ensure that the Questions are neatly typed.
6. Evaluation of answer books, make use of red pen alone
7. The Evaluator is expected to devote reasonably sufficient time for evaluating the answer booklets.
8. No question or part of a question should remain unvalued.
9. Ensure that you have correctly counted the marks before writing the sum (total) on the front page.
10. Question Paper Pattern

Part – A	2 * 9 = 18
Part – B	16*2 = 32 (Either or Type)
	Total =50 Marks

To : All Faculties through HOD's

CC: PA to Pro Chairman for Kind Information
PA to Managing Director for Kind Information

Dr. R. RAJESH
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Palkulam

Register No	9	6	3	3								

ROHINI COLLEGE OF ENGINEERING & TECHNOLOGY

II YEAR B.E/B.Tech./MBA-INTERNAL ASSESSMENT TEST-I

(2023-2024 ODD SEMESTER)

SUBJECT NAME : **SUBJECT CODE :**

YEAR / Branch : **SEMESTER : I**

DATE : **TIME : 9.30 – 12.30 hour**

DURATION :3.00 Hrs **MAX. MARKS : 100**

K1-REMEMBERING	K3-APPLYING	K5-EVALUATING
K2-UNDERSTANDING	K4-ANALYZING	K6-CREATING

PART A(10x2=20 Marks)

Question No	Question	Mark	Blooms taxonomy	Co mapping
1.	Any Level	2		CO1
2.	Any Level	2		CO1
3.	Any Level	2		CO1
4	Any Level	2		CO1
5.	Any Level	2		CO2
6.	Any Level	2		CO2
7.	Any Level	2		CO2
8.	Any Level	2		CO2
9.	Any Level	2		CO3
10.	Any Level	2		CO3

PART B(5x16= 80 Marks)

Question No	Question	Mark	Blooms taxonomy	Co Mapping
11.a	Any Level	16		CO1
	(OR)			
11. b.	Any Level	16		CO1
12.a	Any Level			CO1
	(OR)			
12.b.	Any Level	16		CO1
13.a	Any Level	16		CO2
	(OR)			
13.b	Any Level	16		CO2
14.a		16		CO2

(OR)				
14.b	Any Level	16	K1	CO2
15.a	Any Level	16	K1	CO3
(OR)				
15.b	Any Level	16	K1	CO3

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ROHINI COLLEGE OF ENGINEERING AND TECHNOLOGY

OFFICE OF THE CONTROLLER OF EXAMINATION

IV B.E. / INTERNAL ASSESSMENT TEST - I, AUG &SEPTEMBER 2023

IV YEAR UG IAT I TIME TABLE

DATE	TIME	UG VII SEMESTER REGULATIONS 2017								
		CIVIL A	CIVIL B	CSE	EEE	ECE - A	ECE - B	MECH - A	MECH - B	MECH - C
30-08-2023 (Wednesday)	09.30 A.M TO 11.00 A.M	CE8701/Estimation Costing and Valuation Engineering	CE8702/Railway , Airport,Docks and Harbour Engineering	IT8075/Software Project Management	EI8075/Fiber Optics and Laser Instruments	EC8751/ Optical Communication	EC8791/ Embedded and real time Systems	ME8793/ Process Planning and Cost Estimation	ME8073/UnConventional Machining Processes	ME8791/Mechatronics
31-08-2023	09.30 A.M TO 11.00 A.M	CE8702/Railway , Airport,Docks and Harbour Engineering	CE8703/Structural Design and Drawing	CS8792/ Cryptography& Network Security	OBT751/ Analytical methods and Instruments	EC8791/ Embedded and real time Systems	OMB752/Hospital Management	OML751/ Testing of Materials	ME8793/ Process Planning and Cost Estimation	ME8792/Power Plant Engineering
1-09-2023 (Friday)	09.30 A.M TO 11.00 A.M	CE8703/Structural Design and Drawing	CE8007/Traffic Engineering and Management	OMB752/Hospital Management	EE8703/Renewable Energy Systems	OMB752/Hospital Management	EC8751/ Optical Communication	ME8073/UnConventional Machining Processes	OML751/ Testing of Materials	ME8793/ Process Planning and Cost Estimation
04-09-2023 (Monday)	09.30 A.M TO 11.00 A.M	CE8007/Traffic Engineering and Management	CE8701/Estimation Costing and Valuation Engineering	CS8791/ Cloud Computing	EE8702/Power System Operation and Control	EC8702/AdHoc and Wireless Sensor Networks	EC8701/ Antennas and Microwave Engineering	ME8791/Mechatronics	ME8792/Power Plant Engineering	OML751/ Testing of Materials
05-09-2023 (Tuesday)	09.30 A.M TO 11.00 A.M			MG8591/ Principles of Management	EE8701/ High Voltage Engineering	EC8701/ Antennas and Microwave Engineering	EC8702/AdHoc and Wireless Sensor Networks	ME8792/Power Plant Engineering	ME8791/Mechatronics	ME8073/UnConventional Machining Processes

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ROHINI COLLEGE OF ENGINEERING AND TECHNOLOGY

I ,II &III AND YEAR B.E. / B.Tech. PG - INTERNAL ASSESSMENT TEST (IAT - I &II)

HALL ALLOCATION

DATE:16-04-2024

Sl.No	HALL NO	BRANCH	REGISTER NUMBER		STRENGTH	
			FROM	TO		
1	APJ 102	IIIMECH A	21MEA 001	21MEA 016	16	48
		II MECH A	22ME A001	22ME A017	17	
		II MECH B	22ME B001	22ME B015	15	
2	APJ 103	III MECH B	21MEA 017	21MEA 032	16	48
		II MECH B	22ME B016	22ME B032	17	
		II MECH A	22ME A018	22ME A032	15	
3	APJ 104	III MECH A	21MEA 033	21MEA 049	17	49
		IIMECH A	22ME A033	22ME A049	17	
		II MECH B	22ME B033	22ME B047	15	
4	APJ 202	III MECH A	22ME A050	21MEA 064	20	51
		II MECH A	21MEA 050	21MEA 064	15	
		II MECH B	22ME B048	22ME B064	16	
5	APJ 203	III MECH B	21MEB 001	21MEB 023	26	48
		III MECH C	21MEC 001	21MEC 022	22	
6	APJ 207	III AGRI	21AE 001	21AE 017	17	48
7	APJ 208					48
8	APJ 209					48
		III AGRI	21AE 034	21AE 048	15	
9	APJ 211					31
		III CIVIL	21CE 050	21CE 063	14	
		III EEE	21EE 048	21EE 060	13	
		I MBA	23MBA107	23MBA110	4	
10	APJ 301	I BIO	23BM 041	23BM 062	22	60
		I EEE	23EE 041	23EE 055	15	
		I CSE A	23CS A041	23CS A063	23	
11	APJ 302	III CSE	21CS 001	21CS 017	17	48
		III ECE A	21ECA 001	21ECA 016	16	
		III ECE B	21ECB 001	21ECB 015	15	
12	APJ 303	III CSE	21CS 018	21CS 034	17	48
		III ECE A	21ECA 017	21ECA 032	16	
		III ECE B	21ECB 016	21ECB 030	15	
13	APJ 304	III CSE	21CS 035	21CS 051	17	48
		III ECE A	21ECA 033	21ECA 048	16	
		III ECE B	21ECB 031	21ECB 045	15	
14	APJ 305	III CSE	21CS 052	21CS 065	14	49
		III ECE A	21ECA 049	21ECA 062	14	

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		III ECE B	21ECB 046	21ECB 060	15	
		I MBA	23MBA117	23MBA122	6	
15	APJ 306	I CSE B	23CS B051	23CS B063	13	38
		I ECE	23EC 052	23EC 063	12	
		I MECH	23ME A051	23ME A063	13	
16	APJ 307	III EEE	21EE 001	21EE 015	16	49
		III CIVIL	21CE 001	21CE 016	15	
		I MBA	23MBA001	23MBA018	18	
NEWTON BLOCK						
17	IN 103	III CIVIL	21CE 017	21CE 033	17	49
		I MBA	23MBA019	23MBA050	32	
18	IN 104	I CSE B	23CS B036	23CS B050	15	48
		I ECE	23EC 035	23EC 050	16	
		I MECH	23ME A034	23ME A050	17	
19	IN 109					54
		II BIO	22BM 036	22BM 053	18	
20	IN 110	III EEE	21EE 031	21EE 047	17	48
		II CIVIL	22CE 001	22CE 016	16	
		II CSE A	22CS A001	22CS A015	15	
21	IN 111	III EEE	21EE 016	21EE 030	15	48
		II CIVIL	22CE 017	22CE 033	17	
		II CSE A	22CS A016	22CS A031	16	
22	IN 201	III CIVIL	21CE 034	21CE 049	16	48
		II CIVIL	22CE 034	22CE 048	15	
		II CSE A	22CS A032	22CS A048	17	
23	IN 203					54
		II CIVIL	22CE 049	22CE 054	6	
		II CSE A	22CS A049	22CS A063	15	
		II CSE B	22CS B049	22CS B063	15	
		II EEE	22EE 052	22EE 059	8	
24	IN 209	II EEE	22EE 035	22EE 051	17	50
		II CSE B	22CS B033	22CS B048	16	
		II ECE	22EC 031	22EC 045	15	
25	IN 210	II EEE	22EE 001	22EE 017	17	49
		II CSE B	22CS B001	22CS B016	16	
		II ECE	22EC 001	22EC 015	15	
26	IN 212	II EEE	22EE 018	22EE 034	17	50
		II CSE B	22CS B017	22CS B032	16	
		II ECE	22EC 016	22EC 030	15	
		I MBA	23MBA085	23MBA086	2	
27	IN 302	I CIVIL	22CE 033	22CE 048	16	48
		I AI	23AI033	23AI049	17	
		I AGRI	23AE 033	23AE 047	15	
28	IN 304	I CIVIL	22CE 018	22CE 032	15	48
		I AI	23AI017	23AI032	16	
		I AGRI	23AE 016	23AE 032	17	

29	IN 308	I MBA	23MBA051	23MBA084	34	51
		II ECE	22EC 046	22EC 062	17	
30	IN 309					48
		I AI	23AI001	23AI016	16	
		I AGRI	23AE 001	23AE 015	15	
31	IN 313					35
		I AI	23AI050	23AI063	14	
		I AGRI	23AE 048	23AE 061	14	
32	IN 314	I CSE B	23CS B001	23CS B018	18	54
		I ECE	23EC 001	23EC 018	18	
		I MECH	23ME A001	23ME A018	18	
33	IN316	I CSE B	23CS B019	23CS B035	17	48
		I ECE	23EC 019	23EC 034	16	
		I MECH	23ME A019	23ME A033	15	
ROHINI CENTRAL BLOCK						
34	RCB 101	I BIO	23BM 001	23BM 020	20	60
		I EEE	23EE 001	23EE 020	20	
		I CSE A	23CS A001	23CS A020	20	
35	RCB 102	I BIO	23BM 021	23BM 040	20	65
		I EEE	23EE 056	23EE 060	25	
			23EE 021	23BM 040		
		I CSE A	23CS A021	23CS A040	20	
Kalpana Chawla BLOCK						
36	KC 102	III MECH C	21MEC 023	21MEC 045	27	49
		III MECH B	21MEB 027	21MEB 048	22	
37	KC 103	III MECH B	21MEB 049	21MEB 059	11	40
		III MECH C	21MEC 050	21MEC 058	9	
		I MBA A	23MBA087	23MBA106	20	
38	KC 104	I CSE B	23CS B051	23CS B063	13	38
		I ECE	23EC 052	23EC 063	12	
		I MECH	23ME A051	23ME A063	13	

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IN 212	II CSE B	963322104105	963322104123	18	36
	II MECH B	963322114102	963322114119	18	

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ROHINI COLLEGE OF ENGINEERING & TECHNOLOGY, PALKULAM

Accredited by NAAC with A+ Grade

(AUTONOMOUS)

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

INTERNAL ASSESSMENT TEST - I

Academic Year 2023-2024 (Even Semester)

SUBJECT NAME: Transmission and Distribution
YEAR/BRANCH: II BE EEE
DATE: 17-04-2024
DURATION:3 Hours

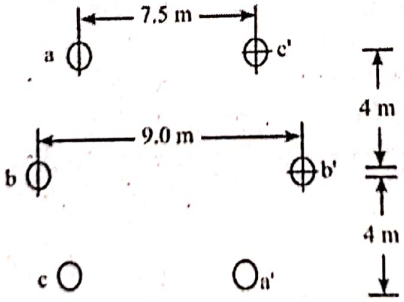
SUB CODE:EE3401
SEMESTER: IV
TIME: 09.30am-12.30pm
MAX. MARKS:100

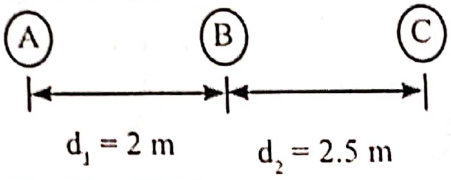
K1-REMEMBERING	K3-APPLYING	K5-EVALUATING
K2-UNDERSTANDING	K4-ANALYZING	K6-CREATING

PART A (10 x 2 = 20 marks)

Ques No	Question	Mark	CO mapping	Blooms Taxonomy
1	Infer the advantages of using bundled conductors.	2	21C212.1	K2
2	List out the parameters affecting skin effect in transmission line.	2	21C212.1	K1
3	Outline the term 'proximity effect.'	2	21C212.1	K2
4	List the different types of overhead conductors.	2	21C212.1	K1
5	Interpret the effect of leading load power factor on voltage regulation of a short transmission line.	2	21C212.2	K2
6	What are the disadvantages of corona?	2	21C212.2	K1
7	How will you reduce the corona loss?	2	21C212.2	K1
8	Infer the significance of surge impedance loading on transmission line.	2	21C212.2	K2
9	List the types of line supports used in transmission and distribution systems.	2	21C212.3	K1
10	What are the factors affecting the sag in a transmission line?	2	21C212.3	K1

PART B (5 x 16 = 80 marks)

Question No	Question	Mark	CO mapping	Blooms Taxonomy
11.a.	Model the inductance per km of a transposed double circuit 3-phase line shown in figure. Each circuit of the line remains on its own side. The diameter of the conductor is 2.532 cm. 	16	21C212.1	K3
	(or)			
11.b.	A 3-phase, 50Hz, 66kV overhead line conductors are placed in a horizontal plane as shown in figure. The conductor diameter is 1.25cm. if the line length is 100km, solve the: (i) capacitance per phase	16	21C212.1	K3

	(ii) charging current per phase, assuming complete transposition of the line.  			
12.a.	Model the expression for inductance of unsymmetrically spaced three phase line.	16	21C212.1	K3
	(or)			
12.b.	Model the expression of capacitance of a bundled conductor.	16	21C212.1	K3
13.a.	A 3-phase, 50Hz transmission line 100km long delivers 20MW at 0.9 pf lagging and at 110kV. The resistance and reactance of the line per phase per km are 0.2Ω and 0.4Ω respectively. The capacitive admittance is 2.5×10^{-6} S/km/phase. Identify: (i) the voltage at the sending end and (ii) efficiency of transmission. Use nominal T method.	16	21C212.2	K3
	(or)			
13.b.	A 275kV transmission line has the following line constants: A=0.85⌊5° and B=200⌊75°. Identify the power at unity power factor that can be received if the voltage profile at each end is to be maintained at 275kV.	16	21C212.2	K3
14.a.	Utilize the rigorous method to model the long transmission line.	16	21C212.2	K3
	(or)			
14.b.	Illustrate the phasor diagram of a short transmission line and derive an expression for voltage regulation and transmission efficiency.	16	21C212.2	K3
15.a.	Two tower of height 30m and 90m respectively support a transmission line conductor of water crossing. The horizontal distance between the towers is 500m. If the tension in the conductor is 1600kg, identify the minimum clearance of the conductor and water and clearance mid-way between the supports. Weight of conductor is 1.5kg/m. Bases of the towers can be considered to be at water level.	16	21C212.3	K3
	(or)			
15.b.	Each line of a 3-phase system is suspended by a string of 3 similar insulators. If the voltage across the line unit is 17.5kV, solve the line to neutral voltage. Assume that the shunt capacitance between each insulator and earth is $1/8^{th}$ of the capacitance of the insulator itself. Also find the string efficiency.	16	21C212.3	K3

IAT1

Answer Key

Part A

1) Advantages of using bundled conductors (2 marks)

→ Self GMD increases and reactance decreases
→ Corona losses gets reduced
→ Radio interference gets reduced
→ Surge impedance loading is increased

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2) Parameters affecting skin effect (2 marks)

* Nature of material
* Diameter of conductor
* Shape of conductor
* Supply frequency

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3) Proximity effect (2 marks)

The non-uniform distribution of alternating current in a conductor due to the presence of other current carrying conductors in the vicinity is called proximity effect.

* It increases the conductor resistance.

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4) Different types of overhead (OH) conductors (2 marks)

(i) Solid conductor
(ii) Stranded conductor
(iii) Bundled conductor
(iv) Hollow conductor
(v) AAC conductor
(vi) ACSR conductor

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5) For leading load power factor, (2 marks)

(*) % Voltage regulation = $\frac{IR\cos\phi_R - IX_L\sin\phi_R}{V_R} \times 100$

(*) $IX_L\sin\phi_R > IR\cos\phi_R \Longrightarrow$ voltage regulation is negative

$\Longrightarrow V_R > V_S$

(*) Voltage regulation decreases with decrease in power factor

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6) Disadvantages of corona (2 marks)

→ Corona affects transmission efficiency
→ Energy loss
→ Voltage drop and current are non-sinusoidal
→ Ozone gas production
→ Causes corrosion
→ Causes inductive interference.

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7) Corona loss can be reduced by (2 marks)

* increasing conductor size
* increasing spacing between conductors
* using bundled conductors

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8) Significance of Surge impedance loading (2 marks)

a) To find the maximum permissible power transfer capability
b) To determine the compensation requirements of a line
c) It represents ideal loading
d) Power factor is unity
e) If load = SIL, voltage and current are uniform along the line
f) If load < SIL ⟹ reactive power is generated
load > SIL ⟹ reactive power is consumed

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9) Different types of line supports (2 marks)

→ Wooden poles
→ Reinforced concrete poles
→ Steel poles
→ Latticed steel towers

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10) Factors affecting sag in transmission line (2 marks)

* Conductor weight
* Conductor location
* Length of span
* Temperature
* Tensile strength
* Tension

Part-B

11) Given:

a)

$$GMR = \frac{2.532}{2} \times 0.7788 = 0.986\ cm = 0.986 \times 10^{-2}\ m$$

Self GMD, $D_s = \sqrt[3]{D_{s1} \times D_{s2} \times D_{s3}}$

$$D_{s1} = \sqrt[4]{D_{aa} \times D_{aa'} \times D_{a'a} \times D_{a'a'}}$$

$$= \sqrt[4]{(0.986 \times 10^{-2}) \times (10.96) \times (10.96) \times (0.986 \times 10^{-2})}$$

$$D_{s1} = 0.57\ m = D_{s3}$$

$$D_{s2} = \sqrt[4]{D_{bb} \times D_{bb'} \times D_{b'b} \times D_{b'b'}}$$

$$= \sqrt[4]{(0.986 \times 10^{-2})^2 \times q^2}$$

$$D_{s2} = 0.3\ m$$

$$\therefore \boxed{D_s = 0.46\ m}$$

(8 marks)

Mutual GMD, $D_m = \sqrt[3]{D_{AB} \times D_{BC} \times D_{CA}}$

$D_{AB} = \sqrt[4]{D_{ab} \times D_{ab'} \times D_{a'b} \times D_{a'b'}} = \sqrt[4]{7.5 \times 9.17 \times 9.17 \times}$

$= 8.3\ m$

$D_{BC} = 8.3\ m$

$D_{CA} = \sqrt[4]{D_{ca} \times D_{ca'} \times D_{c'a} \times D_{c'a'}} = \sqrt[4]{8 \times 7.5 \times 7.5 \times 8}$

$= 7.7\ m$

$D_m = 8.09\ m$

Inductance/phase/m $= 2 \times 10^{-7} \ln \frac{D_m}{D_s}$ (8 marks)

$= 5.73 \times 10^{-7}$

$= 0.573 \times 10^{-3}\ mH$

Inductance/phase/km $= 0.573\ mH$

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11)

b) Equilateral spacing, $d = \sqrt[3]{d_1 \times d_2 \times d_3}$

$= \sqrt[3]{2 \times 2.5 \times 4.5} = 2.82\ m$

Radius, $r = \frac{1.25}{2} = 0.625\ cm$

Spacing, $d = 2.82\ m = 282\ cm$

(8 marks)

(i) Capacitance per phase, $C = \frac{2\pi\varepsilon_0}{\ln \frac{d}{r}} = 0.0091 \times 10^{-9}\ F/m$

$= 0.0091\ \mu F/km$

$\therefore$ C (for length of 100 km) $= 0.91\ \mu F$

(ii) Charging current per phase

$I_c = \frac{V_{ph}}{X_c} = \frac{66000/\sqrt{3}}{1/2\pi f C} = 10.9\ A$

(8 marks)

Inductance of unsymmetrically spaced 3ϕ line

* diagram (5 marks)
* Inductance (11 marks)

Capacitance of bundled conductor

* diagram (5 marks)
* Capacitance (11 marks)

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3) Given:

2)

$$R = 0.2 \times 100 = 20\,\Omega$$

$$X_L = 0.4 \times 100 = 40\,\Omega$$

$$Y = 2.5 \times 10^{-6} \times 100 = 2.5 \times 10^{-4}\,S$$

$$Z = 20 + j40$$

$$V_R = \frac{110 \times 10^3}{\sqrt{3}} = 63508\,V$$

$$I_R = \frac{20 \times 10^6}{\sqrt{3} \times 110 \times 10^3 \times 0.9} = 116.6\,A$$

$$\cos\phi_R = 0.9$$

$$\sin\phi_R = 0.435$$

(10 marks)

(i) $\vec{V_R} = 63508\,V$

$$\vec{I_R} = I_R(\cos\phi_R - j\sin\phi_R) = (105 - j50.7)$$

Capacitor voltage, $\vec{V_1} = \vec{V_R} + \vec{I_R}\frac{\vec{Z}}{2} = (65572 + j1593)$

$$\vec{I_C} = jY\vec{V_1} = (-0.4 + j16.4)$$

$$\vec{I_S} = \vec{I_R} + \vec{I_C} = (104.6 - j34.3)$$

$$\vec{V_S} = \vec{V_1} + \vec{I_S}\frac{\vec{Z}}{2} = (67304 + j3342)$$

$$|\vec{V_S}| = \sqrt{67304^2 + 3342^2} = 67387\,V$$

Sending end line voltage, $V_S = 67387 \times \sqrt{3} = 116.717\,kV$

(ii) Total line losses $= 3I_S^2 \frac{R}{2} + 3I_R^2 \frac{R}{2}$ (6 mark

$= 0.770\,MW$

Transmission efficient $= \frac{20}{20+0.770} = 96.29\%$.

---

13) b) Given: $A = 0.85\angle 5^\circ$; $B = 200\angle 75^\circ$; $V_S = V_R = 275kV$; $\alpha = 5^\circ$; $\beta =$

Solution: Power delivered at unity pf, $P = \frac{V_S V_R}{B}\cos(\beta-\delta) -$

To find δ: $Q = \frac{V_S V_R}{B}\sin(\beta-\delta) - \frac{AV_r^2}{B}\sin(\beta-\alpha) = 0 \Longrightarrow \delta = 22^\circ$ $\cos($ (8 ma

$\therefore P = 118\,MW$ (8 marks)

---

14) a) Long transmission line (Rigorous method)

Diagram (4 marks)

V_R , I_R (6 marks)

V_S , I_S (6 marks)

---

14) b) Short transmission line

Circuit diagram (4 marks)

Phasor diagram (4 marks)

Derivations (4 marks)

Voltage regulation (2 marks)

Transmission efficiency (2 marks)

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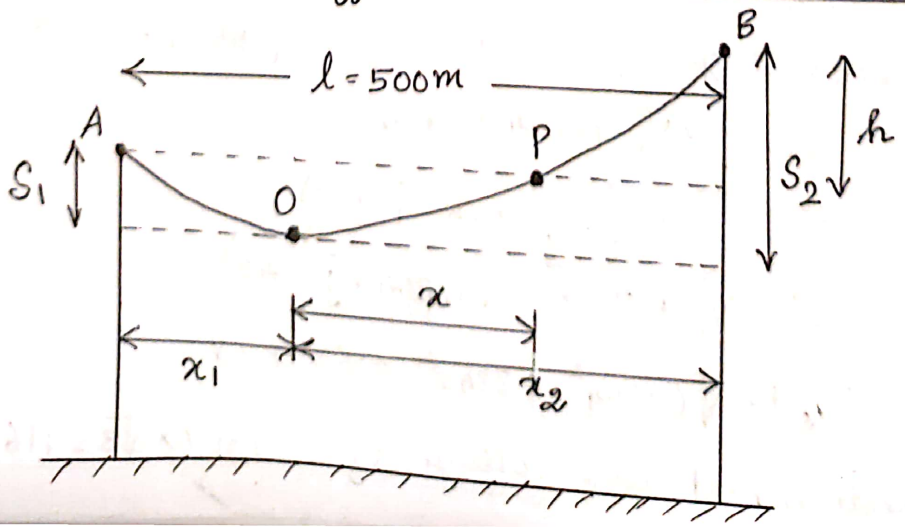
15) a)



(2 mark

Given:

$l = 500m$

$w = 1.5 kg/m$

$T = 1600 kg$

$h =$ Height difference of towers $= 90 - 30 = 60m$

Solution:

Let $x_1 + x_2 = 500$ —— (1)

Sag, $S_1 = \frac{w x_1^2}{2T}$

$S_2 = \frac{w x_2^2}{2T}$

We know, $h = S_2 - S_1$

$$60 = \frac{w x_2^2}{2T} - \frac{w x_1^2}{2T}$$

$$= \frac{w}{2T}(x_2^2 - x_1^2)$$

$$= \frac{w}{2T}(x_2 + x_1)(x_2 - x_1)$$

$$60 = \frac{1.5}{2 \times 1600} \times 500 \, (x_2 - x_1)$$

$\therefore x_2 - x_1 = 256$ —— (2)

Solving (1) & (2) $\Rightarrow$ $x_1 = 122m$ (8 marks)

$x_2 = 378m$

$S_1 = \frac{1.5 \times 122^2}{2 \times 1600} = 7m$

Clearance of lowest point O from water level = 30.7

$$x = 250 - x_1$$
$$= 250 - 122 = 128\,m$$

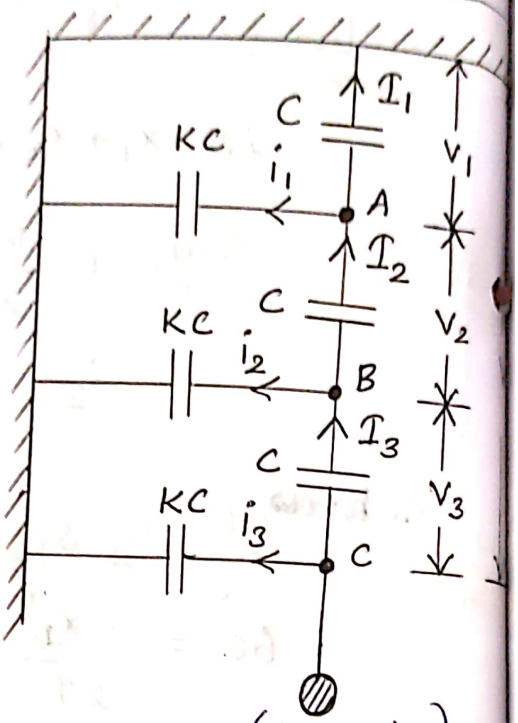
$$S_{mid} = \frac{wx^2}{2T} = \frac{1.5 \times 128^2}{2 \times 1600} = 7.68\,m$$ (8 mar

Clearance of mid point P from water level = 23 + 7.68 = 3

15) b) Given : $n = 3$

$V_3 = 17.5\,kV$

$K = \frac{1}{8} = 0.125$



(6 marks)

Solution :

At A,

$$I_2 = I_1 + i_1$$
$$V_2 \omega C = V_1 \omega C + V_1 K \omega C$$
$$V_2 = V_1 (1 + K)$$
$$V_2 = 1.125\,V_1 \quad \text{—— (1)}$$

At B,

$$I_3 = I_2 + i_2$$
$$V_3 \omega C = V_2 \omega C + (V_1 + V_2)\,\omega KC$$ (6 marks)
$$V_3 = V_2 (1 + K) + V_1 K$$
$$= \left[(1.125\,V_1) \times (1.125)\right] + 0.125\,V_1$$
$$V_3 = 1.39\,V_1 \quad \text{—— (2)}$$
$$\therefore V_1 = \frac{V_3}{1.39} = \frac{17.5}{1.39} = 12.59\,kV$$
$$V_2 = 1.125\,V_1 = 14.16\,kV$$

Line to neutral voltage = $V_1 + V_2 + V_3 = 44.25\,kV$;

(4 mar

String efficiency

η = Voltage across the string / n x Voltage across the unit nearest to conductor

$= \frac{44.25}{3 \times 17.5} \times 100$

$\eta = 84.28\,\%$

ANNA UNIVERSITY CHENNAI

CHENNAI - 600 025.

INTERNAL ASSESSMENT NOTE BOOK

Internal Assessment : First / Second / Third

Name of the Student	S. Ari Ram				
Roll No.	09	Register Number	9 6 3 3 2 2 1 0 5 0 1 0		
College Code	9 6 3 3	College Name	Rohini College of Engineering & Technology		
Degree/Branch	BE/EEE	Section	-	Semester	04
Subject Code	EE3401	Date & Session	17/4/24		
Subject Title	Transmission and Distribution				

No. of Pages Used	11	All Particulars Given are Verified	Signature of the Hall Superintendent with Date
		Name of Hall Superintendent	Rajv Ceehil

PART - A				PART - B & C					
						(I)		(II)	
QUESTION No.	CO	MARKS		QUESTION No.		CO	MARKS	CO	MARKS
1	2	6	2	11	A				
2	2	7	2		B	16			
3	2	8		12	A	16			
4	2	9	2		B				
5	2	10	2	13	A	12			
					B				
				14	A				
					B	16			
						15	A	16	
							B		

Grand Total (in words)	94½
Grand Total	

Signature of the Examiner

Instructions to the Candidates :

1. Write your register number at the top right hand side of the QUESTION PAPER
2. Check THE REGULATION, DEGREE, BRANCH, SEMESTER, SUBJECT CODE / TITLE OF THE QUESTION PAPER BEFORE ANSWERING THE QUESTIONS.
3. Answers must be legibly written in ink (Blue or Black)
4. POSSESSION OF ANY INCRIMINATING MATERIAL AND MALPRACTICE OF ANY NATURE SHALL BE PUNISHABLE AS PER RULES.
5. Do not write anything apart from REGISTER NUMBER IN THE QUESTIONS PAPER.

VISION

To be an academic institute of continuous excellence towards education and research in rural regime and provide service to nation in terms of nurturing potentially higher social, ethical and engineering companion graduands.

MISSION

- To foster and promote technically competent graduands by imparting the state of art Engineering education in rural regime.
- To enunciate research assisted scientific learning by dissemination of knowledge towards science, agriculture, industry and national security.

V-2

PART - A			PART - B & C					
QUESTION No.	CO	MARKS	QUESTION No.		(I) CO	(I) MARKS	(II) CO	(II) MARKS
1			6	A				
2				B				
3			7	A				
4				B				
5			8	A				
				B				
			9	A				
				B				

Grand Total (in words)	
Grand Total	

Signature of the Examiner

Part - A

1.) *) Self increased GMD and
*) corona loss is less
*) Radio interference is low
*) Surge impedance load is increased

2.) *) Nature of the material
*) Shape of the Conductor
*) size of the Conductor
*) frequency of the Supply

3.) The non-uniform distribution of alternating current in a conductor due to the presence of the current carrying conductor in the vicinity is called proximity effect.

4.) *) solid Conductor
*) stranded conductor
*) Hallow Conductor
*) Bundled Conductor
*) ACSR Conductor
*) AAC conductor

5.) % voltage regulation = $\frac{IR\cos\phi_R - IX_L \sin\phi_R}{V_R} \times 100$

if $IX_L \sin\phi_R > IR\cos\phi_R$, it will be negative

$V_R > V_S$

6.) *) Energy loss
*) lower the efficiency
*) Produce ozone gas
*) Starts Corossion

2

7.) *) By increasing the capacitor size
*) By increasing the distance between the conductors.
*) By using Bundled Conductor.

2

8.)

9.) *) wooden poles
*) Reinforced Concrete poles
*) Steel poles
*) latticed steel poles

2

10.) *) weight of the conductor
*) location of the conductor
*) Temperature
*) Tensile strength
*) wind

2

Part-B

11) b) Given:-

$d_1 = 2m$

$d_2 = 2.5m$

$d_3 = 4.5m$

$d = 1.25cm$

$r = \frac{1.25}{2} = 0.625\ cm$

$S_d = \sqrt[3]{d_1 d_2 d_3}$

$= \sqrt[3]{2 + 2.5 + 4.5} = 2.82\ m$

$S = 282\ cm$

i) Capacitance per phase:-

$$C = \frac{2\pi\varepsilon_0}{\ln d/r} =$$

$$= \frac{2 \times 3.14 \times 8.854 \times 10^{-12}}{\ln \frac{1.25}{0.625}}$$

$$= 0.91 \times 10^{-6}\ \mu F/m$$

~~$C = 0.91 \mu F$ /km~~

$$= 0.91 \times 10^{-3}\ \mu F/km$$

for 100 km 0.091 ~~μF~~ μF

ii) charging current per phase :-

$$I_c = \frac{\frac{6600}{\sqrt{3}}}{\frac{1}{2\pi \times 50 \times 0.91}}$$

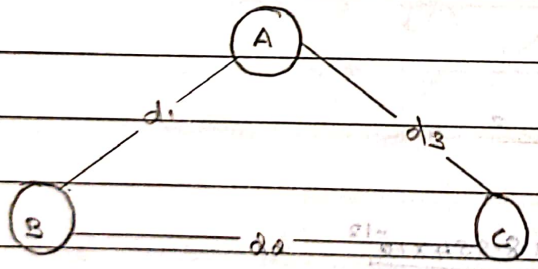
$$I_c = 10.9\ A$$

Result :-

$$C = 0.91 \times 10^{-3}\ \mu F/km$$

$$I_c = 10.9\ A$$

12.) a) Consider a 3 phase conductors A, B, C carrying a current of I_A, I_B, I_C with a equal distance between the Conductors with a distance of d_1, d_2, d_3



when they are carrying equal amount of current then,

$$I_A + I_B + I_C = 0 \quad \text{---- (1)}$$

when the distance between the conductors are not equal and at equidistant from each other conductors, this case is called unsymmetrically spaced three phase line. Due to this the inductance and capacitance will act and change the current in the conductors.

In order to equalize the current in the conductors. its positions will be changed. This is called as transposition. Even though the supply voltage is equal, the voltage in the conductors will differ due to the unequal distance of the conductors.

Let us consider that the conductors are at equidistance and the voltage (or) current in the conductors are equal, Then,

$I_A = (1+j0)$

$I_B = (-0.5 - j0.866)$

$I_C = (-0.5 + j0.866)$

$$\psi_A = \frac{\mu_0}{2\pi}\left[(1/4 + \ln r)I - I(-0.5 - j0.866)\ln d_2 - I(-0.5 + j0.866)\ln d_3\right]$$

$$= \frac{\mu_0 I}{2\pi}\left[1/4 + \ln r + 0.5\ln d_2 + 0.5\ln d_3 + j0.866\ln d_2 - j0.866\ln d_3\right]$$

$$= \frac{\mu_0}{2\pi}\left[\ln(e^{1/4}) + \ln\frac{\sqrt{d_2 d_3}}{r} + j0.866\ln + \ln d_2/r\right]$$

$$\frac{\varphi_A}{I_A} = \frac{\varphi_n}{I} = \frac{4\pi \times 10^{-7}}{2\pi}\left[\ln\frac{1}{r_1} + \ln\sqrt{d_2 d_3} + \ln\sqrt[n]{0.732\sqrt{d_3/d_2}}\right]$$

$$L_A = 2\times10^{-7}\left[\ln\frac{1}{r_1} + \ln\sqrt{d_2 d_3} + \ln\sqrt{d_3/d_2}\right] \text{ H/m}$$

$$L_B = 2\times10^{-7}\left[\ln\frac{1}{r_1} + \ln\sqrt{d_3 d_1} + \ln\sqrt{d_3/d_2}\right] \text{ H/m}$$

$$L_C = 2\times10^{-7}\left[\ln\frac{1}{r_1} + \ln\sqrt{d_1 d_2} + \ln\sqrt{d_3/d_2}\right] \text{ H/m}$$

18.)a) Soln:-

$R = 0.2 \times 100 = 20\ \Omega$

$X_1 = 0.4 \times 100 = 40\ \Omega$

$Y = 2.5\times10^{-6} \times 100 = 2.5\times10^{-4}\ S$

$Z = (20 + j40)$

$V_R = \frac{110\times10^3}{\sqrt{3}} = 63508.5$

$P_R = 20MW$ (or) 2×10^6

$I_R = \frac{2\times10^6}{\frac{110\times10^3}{\sqrt{3}} \times 0.9} =$?

$\cos\phi_R = 0.9$

$\sin\phi_R = 0.435$

$\vec{V_R} = 63508.5$

$\vec{I_R} = I_R(\cos\phi_R - j\sin\phi_R)$

$\vec{V_1} = \vec{V_R} + \vec{I_R} + \vec{Z/2}$

ii) efficiency transmission :-

$= 3I_R^2 \cdot R/2 + 3I_S^2 \, R/2$

$= 0.770$

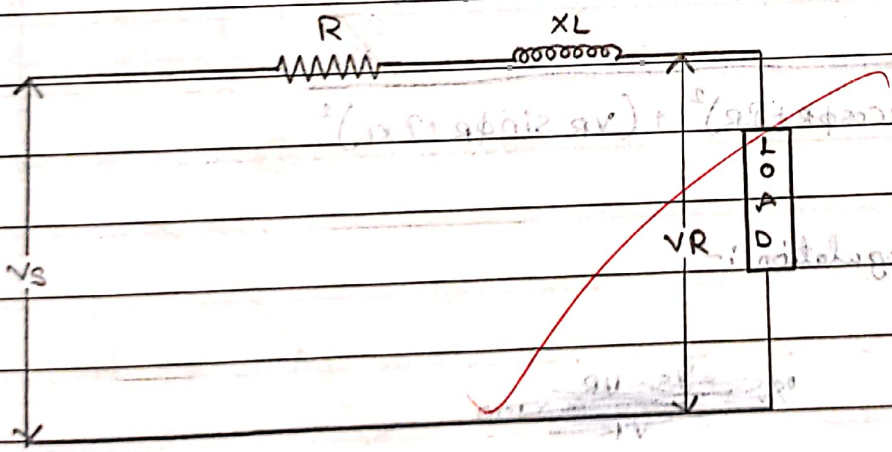
$\frac{20}{20+0.770} =$

$= 0.962$

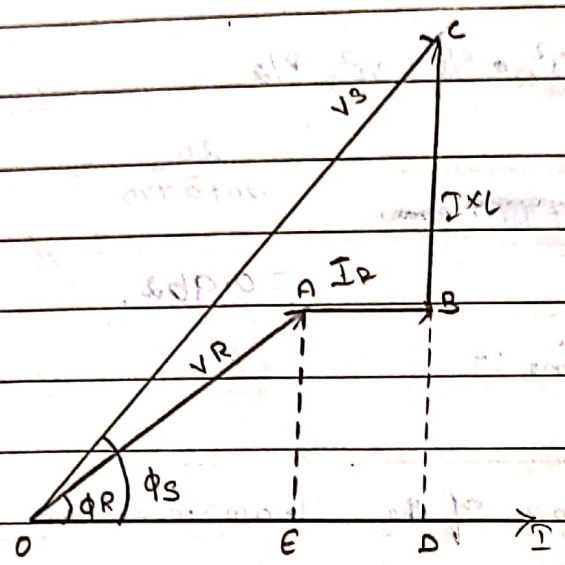
14.3b) short transmission line :-

The distance of the transmission line must be less than 50 km. The voltage transfred will be less than 22 kv and also due to the short distance, the capacitance won't act in this transmission. only the inductance and Resistance will act on this short transmission line.

Circuit Diagram :-



Phasor diagram :-



In the right angle triangle

$$OC^2 = OD^2 + DC^2$$

$$V_S^2 = (OE + ED)^2 + (DB + BC)^2$$

$$V_S^2 = (V_R \cos\phi_R + IR)^2 + (V_R \sin\phi_R + IX_L)^2$$

$$V_S = \sqrt{(V_R \cos\phi_R + IR)^2 + (V_R \sin\phi_R + IX_L)^2}$$

ii) % Voltage Regulation :-

$$\% = \frac{V_S - V_R}{V_R} \times 100$$

$$\% = \frac{IR\cos\phi_R + IX_L \sin\phi_R}{V_R} \times 100$$

$$\cos\phi_R = \frac{OD}{OC} = \frac{I_R \cos\phi_R}{V_R}$$

$$\frac{V_F \cos\phi_R + I_R}{V_R}$$

(To be continued...)

15.) b.)

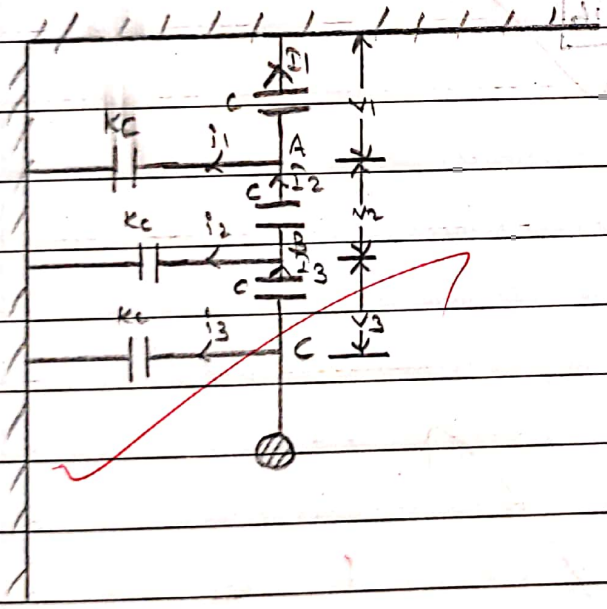
Qn:-

$V_g = 17.5$ kV

$n = 3$

$K = 1/8 = 0.125$

Diagram:-



At point A,

$I_2 = I_1 + i_1$

$V_g = V_1(1+K)$

$V_2 = 1.125 V_1$

At point B,

$V_3 = V_2(1+K) + V_1 K$

$= ((1.125 V_1) * 1.125) + 0.125 K$

$V_3 = 0.159 V_1$

$V_1 = \frac{V_3}{0.159}$

$V_1 = \frac{17.5}{0.159}$

$\boxed{V_1 = 12.59 \text{ KV}}$ $\boxed{V_2 = 14.16}$

line to neutral voltage

$= V_1 + V_2 + V_3$

$= 12.59 + 14.16 + 17.5$

$= 44.25 \text{ KV}$

iii) string efficiency :-

$\eta = \frac{44.25}{3 \times 17.5}$

$\boxed{\eta = 84.28 \%}$

Part B

4.b) ii) Transmission efficiency :-

$$\eta = \frac{\text{Power delivered}}{\text{Power supplied}} \times 100$$

$$= \frac{V_R I_R \cos\phi_R}{V_S I_S \cos\phi_S} \times 100$$

$$= \frac{V_R I_R \cos\phi_R}{V_R I_R \cos\phi_R + I^2 R} \times 100$$

$$\boxed{\eta = \frac{V_R I_R \cos\phi_R}{V_R I_R \cos\phi_R + I^2 R} \times 100}$$