AMET
ACADEMY OF MARITIME EDUCATION AND TRAINING
DEEMED TO BE UNIVERSITY
(Under Section 3 of UGC Act 1956)

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE FILE

Faculty In- Charge	:	**Dr.D.Lakshmi**
Course Code	:	**UDEE701**
Course Name	:	**Power System Protection and Switchgear**
Dept./ Batch/ Year/ Sem/ Group	:	**EEE/9/IV/VII/G1**
Academic Year	:	**2019-2020**

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COURSE FILE CONTENT

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

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Course Co-Ordinator **Approved by PAC** **HOD/Dean**

Dr. T. SASILATHA, M.E., Ph.D.
Dean - EEE
ACADEMY OF MARITIME EDUCATION AND TRAINING
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135, East Coast Road,
Kanathur - 603112, Chennai, India.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

VISION

To emerge as a Centre for higher learning and research through development of highly competent, innovative and world class Marine Electrical and Electronics Engineers while remaining sensitive to ethical, societal and environmental issues.

MISSION

- To impart quality education in order to produce highly innovative, socio- economically conscious Marine Electrical and Electronics Engineers.
- To provide knowledge and skills, that is essential to meet the local and global demands in Marine Electrical and Electronics Engineering.
- To upgrade student's technical knowledge through industry interaction activities.
- To foster strong ethics, positive attitude and transform the Department into Centre of Excellence by promoting world class research and development to meet the challenging needs of society.
- To motivate and guide students for developing entrepreneurship or pursue higher education and train them for overall personality development.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

B.E.-ELECTRICAL AND ELECTRONICS ENGINEERING - MARINE

PROGRAM OUTCOMES (PO's)

PO1: Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and Team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10:
Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

B.E.-ELECTRICAL AND ELECTRONICSENGINEERING - MARINE

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

The Electrical and Electronics Engineering –Marine Program graduates will

PEO1:

Have a successful career in Marine or other related Electrical and Electronics Engineering fields or pursue higher education and research in multidisciplinary area.

PEO2:

Apply Engineering fundamentals, technical knowledge, skills and modern tools to solve real world Electrical Engineering problems in Maritime industries.

PEO3:

Adapt to any environment and practice the ethics of their profession, consistent with a sense of social responsibility.

PEO4:

Exhibit the skills by updating the breadth of knowledge in the life-long learning process to meet the global challenges.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

B.E.-ELECTRICAL AND ELECTRONICS ENGINEERING - MARINE

PROGRAM SPECIFIC OUTCOMES (PSO'S)

PSO1:

Apply the knowledge of Electrical Engineering, investigate and solve the complex Marine Electrical Engineering problems to meet the specified needs with appropriate considerations for the society.

PSO2:

Develop solutions for complex Engineering problems in the broad field of power electronics and drives, power systems, high voltage Engineering and Marine Engineering and control.

PSO3:

Analyze, design and integrate Electrical systems in on board ships and apply modern tools and techniques in marine industries and create passion for life-long learning and research in advanced fields.

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Department of Electrical and Electronics Engineering

TIME TABLE for ODD Semester 2019-20

FOURTH YEAR

Programme : BE -EEEM Semester : VII Batch No. 9

Hour	1st Hour	2nd Hour		3rd Hour	4th Hour		5th Hour	6th Hour	7th Hour
Time	09:00 to 09.50	09.50 to 10.40		10:55 to 11:50	11:50 to 12.45		13.30 to 14:20	14:20 to 15:10	15:10 to 16:00
MON	Solid State Drives (Mr.S.Janarthanan)	Seminar (Dr.Devabrindha)		High Voltage on Merchant ships (Mr.Aran)	Marine Control Engineering and Automation (Ms.Dhanya)		Marine Electrical Protection and Switch gear (Dr.Lakshmi)	Slow learner Marine Electrical Protection and Switch gear (Dr.Lakshmi)	Library (Mr.Gnanvel)
TUE	High Voltage on Merchant ships (Mr.Aran)	Solid State Drives (Mr.S.Janarthanan)		Marine Electrical Protection and Switch gear (Dr.Lakshmi)	PEC-III (Mr.Gnanavel & Mrs.Jegadeeswari)		Marine Control Engineering and Automation (Ms.Dhanya)	Yoga (Dr.Bakthavatchalam)	
WED	High Voltage on Merchant ships (Mr.Aran)	Marine Electrical System Design Layout (Mr.S.Amitrtharaj)		PEC-III (Mr.Gnanavel & Mrs.Jegadeeswari)	Marine Control Engineering and Automation (Ms.Dhanya)		High Voltage and Switchgear Lab (Mr.Aran)		Coaching Class for Slow Learners Special Electrical Machines (Mrs.Jegadeeswari)
THU	Solid State Drives (Mr.S.Janarthanan)	PEC-III (Mr.Gnanavel & Mrs.Jegadeeswari)		Marine Electrical System Design Layout (Mr.S.Amitrtharaj)	High Voltage on Merchant ships (Mr.Aran)		Minor Project (Dr.Lakshmi)		Placement training
FRI	Marine Electrical Protection and Switch gear (Dr.Lakshmi)	Marine Electrical System Design Layout (Mr.S.Amitrtharaj)		Solid State Drives (Mr.S.Janarthanan)	Marine Control Engineering and Automation (Ms.Dhanya)		Marine Electrical System Design Layout (Mr.S.Amitrtharaj)	Value Added Training Programme (Mr.Benjamin)	

TEA BREAK LUNCH

T - Tutorial

Course In Charge

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Department of Electrical and Electronics Engineering

TIME TABLE for ODD Semester 2019-20

FOURTH YEAR

Programme : BE -EEEM Semester : VII Batch No. 9

Hour	1st Hour	2nd Hour		3rd Hour	4th Hour		5th Hour	6th Hour	7th Hour
Time	09:00 to 09.50	09.50 to 10.40		10:55 to 11:50	11:50 to 12.45		13.30 to 14:20	14:20 to 15:10	15:10 to 16:00
MON							Marine Electrical Protection and Switch gear (Dr.Lakshmi)	Slow learner Marine Electrical Protection and Switch gear (Dr.Lakshmi)	
TUE				Marine Electrical Protection and Switch gear (Dr.Lakshmi)					
WED									
THU									
FRI	Marine Electrical Protection and Switch gear (Dr.Lakshmi)								

TEA BREAK LUNCH

T - Tutorial

Course In Charge

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GROUPWISE STUDENT

Course: B.E. - Electrical and Electronics Engineering-Marine
Batch: BE(EEEM)-9
Group: 1

S.No	Roll No	Reg. No	Student Name
1	EE297	AEE16001	ABIRAJ.B
2	EE298	AEE16002	AVINASH VIJAY
3	EE299	AEE16003	AZARUTHEEN S
4	EE300	AEE16004	BEER MOHAMED UVAIZ. N
5	EE301	AEE16005	DHARUN.S
6	EE302	AEE16006	DINESH KUMAR.M
7	EE303	AEE16007	GANESHBABU K
8	EE304	AEE16008	GOKULAKRISHNAN.B
9	EE305	AEE16009	IMMANUEL PETER
10	EE306	AEE16010	JOEL ROBINSON
11	EE308	AEE16012	KARTHI. P
12	EE309	AEE16013	KRISHNARAJ.S
13	EE310	AEE16014	MOHAN RAJ R
14	EE311	AEE16015	NAVEEN RAJ. R
15	EE312	AEE16016	PUNNOOSE BENNY
16	EE315	AEE16019	SAMUEL MATHEW.G
17	EE316	AEE16020	SNAHASISH SAHA
18	EE318	AEE16022	SURIYA R
19	EE319	AEE16023	VENKATESH S
20	EE320	AEE16024	VIGNESH.B
21	EE321L	AEE16032L	SRI RAM SURATH KUMAR. V
22	EE322	AEE16025	IVAN CELIO ALVES MAYER
23	EE323	AEE16026	SREERAG SREEKUMAR
24	EE324	AEE16027	PRAVEEN.D
25	EE325L	AEE16028L	AKASH S
26	EE326L	AEE16029L	ANITOSH MONDAL
27	EE327L	AEE16030L	SANTHOSH KUMAR D
28	EE328L	AEE16031L	VAITHIYANATHAN M S
29	EE376L	AEE16033L	SURYA .A

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PROGRAM	B.E (Electrical and Electronics Engineering-Marine)				
Course Code UBEE704	Course Name Marine Electrical Protection and Switch Gears		L 3	T 0	P 0	C 3
Year and Semester	IV Year & VII Semester		Contact Hours Per Week 4 Hrs			
Prerequisite course	Transmission and Distribution					
Course category	**Humanities and Social Sciences**	**Management courses**	**Professional Core**		**Professional Elective**	
			√			
	Basic Science	**Engineering Science**	**Open Elective**		**Mandatory**	
Course Objectives	1. To learn various earthing practices usage of symmetrical components to estimate fault current 2. Introduce students to power system protection and switchgear.					
Course Outcomes	After successful completion of Course, the students will be able to 1. Illustrate various protection schemes in marine electrical systems 2. Compare different protective relays 3. Distinguish different protection schemes for apparatus such as generator, motor and transformer 4. Analyze different phenomena of circuit interruptions 5. Compare different types of circuit Breakers 6. Apply the concept of protection methods and equipments in marine electrical systems					

PPOs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	3	-	-	-	-	-	-	-	-	3	-	-
CO2	3	3	3	2	-	-	-	-	-	-	2	3	3	3	3
CO3	3	3	2	3	-	-	-	-	-	-	3	3	3	3	-
CO4	3	3	3	3	-	-	-	-	-	-	1	2	3	3	3
CO5	3	2	3	2	3	-	-	-	-	-	2	3	3	2	-
CO6	3	2	3	2	3	-	-	-	-	-	3	3	3	2	2
AVERAGE	3	2.6	2.8	2.5	3	-	-	-	-	-	2.2	2.8	3	2.6	2.7
CORRELATION LEVELS				1. SLIGHT (LOW)				2. MODERATE (MEDIUM)				3. SUBSTANTIAL (HIGH)			

UNIT I : INTRODUCTION 12 Hrs

Principles and need for protective schemes – nature and causes of faults – types of faults –fault current calculation using symmetrical components – Power system earthing – Zones of protection and essential qualities of protection - Protection scheme.

UNIT II: OPERATING PRINCIPLES AND RELAY CONSTRUATIONS 12 Hrs

Electromagnetic relays – Over current, directional, distance and differential under frequency relays – static relays.

UNIT III: APPARATUS PROTECTION 12 Hrs

Apparatus – protection for transformer, generator, motor, protection of bus bars, transmission lines –

CTs and PTs and their applications in protection schemes – Describe cables suitable for use in locations subject to high temperatures with oil mist or vapor.

UNIT IV: THEORY OF CIRCUIT INTERRUPTION **12Hrs**

Physics of arc phenomena and arc interruption – Re-striking voltage & Recovery voltage, rate of rise of recovery voltage – resistance switching – current chopping – interruption of capacitive current – DC circuit breaking.

UNIT V: CIRCUIT BREAKERS **12Hrs**

Types of Circuit Breakers – Air blast, Air break, oil, SF6 and Vacuum circuit breakers – comparative merits of different circuit breakers – Testing of circuit breakers.

TOTAL: 60 Hours.

TEXT BOOKS:

1. B. Ravindranath and N. Chander, Power System Protection &Switchgear', New Age International (P) Limited, 2014 (2nd Edition).
2. Badri Ram, Vishwakarma, Power System Protection and Switchgear', Tata McGraw hill, 2001.

REFERENCES:

1. Sunil S. Rao, Switchgear and Protection', Khanna publishers, New Delhi, 11th Edition reprint 3rd Edition,2008
2. C.L. Wadhwa, Electrical Power Systems', New age International (P) Ltd., 2006.
3. M.L. Soni, P.V. Gupta, V.S. Bhatnagar, A. Chakrabarti, A Text Book on Power System Engineering', Dhanpat Rai & Co., 2008.
4. Y.G. Paithankar and S.R. Bhide, _Fundamentals of Power System Protection', Prentice Hall of India Pvt. Ltd., New Delhi, 2003.

COURSE OBJECTIVE & COURSE OUTCOMES

Name of the Faculty:Dr.D.Lakshmi, **ASP/EEE**

Programme& Batch: B.E-EEE-M & 9

Year / Semester :IV /VII

Subject Code & Name: UBEE704 / **Marine Electrical Protection and Switch Gears**

Academic Year: 2019 - 2020

COURSE OBJECTIVES

To educate the causes of abnormal operating conditions of the apparatus and system.
To understand the operation of various protectives devices.
To impart knowledge on apparatus protection using relays and circuit breakers.

COURSE OUTCOMES

UBEE704.1	Illustrate various protection schemes in marine electrical systems
UBEE704 .2	Compare different protective relays
UBEE704 .3	Distinguish different protection schemes for apparatus such as generator, motor and transformer
UBEE704 .4	Analyze different phenomena of circuit interruptions
UBEE704 .5	Compare different types of circuit Breakers
UBEE704.6	Apply the concept of protection methods and equipments in marine electrical systems

COURSE MAPPING WITH POs AND PSOs& JUSTIFICATION OF MAPPING

Name of the Faculty:Dr.D.Lakshmi, **ASP/EEE**

Programme& Batch: B.E-EEE-M & 9

Year / Semester :IV /VII

Subject Code & Name: UBEE704 / **Marine Electrical Protection and Switch Gears**

Academic Year: **2019 - 2020**

COURSE OBJECTIVES

To educate the causes of abnormal operating conditions of the apparatus and system.
To understand the operation of various protectives devices.
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COURSE OUTCOMES

UBEE704.1	Illustrate various protection schemes in marine electrical systems
UBEE704 .2	Compare different protective relays
UBEE704 .3	Distinguish different protection schemes for apparatus such as generator, motor and transformer
UBEE704 .4	Analyze different phenomena of circuit interruptions
UBEE704 .5	Compare different types of circuit Breakers
UBEE704.6	Apply the concept of protection methods and equipments in marine electrical systems

CO	Course Outcome Statements	Program Outcomes (POs)												PSOs		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	Illustrate various protection schemes in marine electrical systems	3	-	-	3	-	-	-	-	-	-	-	-	3	-	-
2	Compare different protective relays	3	3	3	2	-	-	-	-	-	-	2	3	3	3	3
3	Distinguish different protection schemes for apparatus such as generator, motor and transformer	3	3	2	3	-	-	-	-	-	-	3	3	3	3	-
4	Analyze different phenomena of circuit interruptions	3	3	3	3	-	-	-	-	-	-	1	2	3	3	3
5	Compare different types of circuit Breakers	3	2	3	2	3	-	-	-	-	-	2	3	3	2	-
6	Apply the concept of protection methods and equipments in marine electrical systems	3	2	3	2	3	-	-	-	-	-	3	3	3	2	2
Average		2.2	3	2.6	2.8	2.5	3	-	-	-	-	-	2.2	2.8	3	2.6

CORRELATION LEVELS: 1. SLIGHT (LOW) 2. MODERATE (MEDIUM) 3. SUBSTANTIAL (HIGH)

JUSTIFICATION OF MAPPING:

Course Code & Subject: UBEE704 & Marine Electrical Protection and Switch Gears	
UBEE704.1	Students have strong knowledge of protective schemes (PO1). Students do the research in zones of protection (PO4). Ability to simulate the power system components from single line diagram (PSO1).
UBEE704.2	Students could apply the knowledge of relays for engineering problems (PO1). They could analyze problems related to engineering sciences (PO2) and can develop the solutions to meet the specific needs (PO3). Students apply research based knowledge of control devices(PO4). Students moderately contribute to multidisciplinary settings(PO11) and make out the need for lifelong learning (PO12). Students are accomplished to form an effective Protection for power system(PSO1) and integrate for the sustainability of system(PSO2); They could also contribute for the development of computer control of the same(PSO3).
UBEE704.3	Students could apply the knowledge of principles of apparatus protection to solve engineering problems (PO1), Problem analysis in Protection of apparauts could be carried out (PO2) and Process could be designed for finding solutions (PO3). Students apply research based knowledge of protective devices (PO4) and apply for lifelong learning (PO12). Technical skills could be used to analyze the performance of systems (PSO1) and execute the same (PSO2).
UBEE704.4	Students apply the knowledge about static relays to solve complex engineering problems (PO1) and formulate the protection schemes (PO2). Designing the static relays to meet the need PO3) and analyze them to find the solution(PO4). Students manage projects (PO11) and recognize the need for lifelong learning (PO12) in electrical field. Students are skilful to model, Simulate and analyze protection of power system (PSO1), execute (PSO2) and also contribute for the development of smart power system (PSO3).
UBEE704.5	Students could apply the knowledge of science and engineering fundamentals in circuit breakers (PO1), analyze the same related to various testing methods (PO2). They develop circuit breakers with safety and environmental considerations (PO3), conduct experiments to get clear data (PO4) and learn the skills related to power system networks (PO5) Understand engineering principles (PO11) and apply for lifelong learning (PO12). They do modeling and analyze testing methods in the circuit breakers (PSO1 and execute the system (PSO2) for the development of good quality power grid (PSO3).

UBEE704.6	Students could apply the knowledge of Power System Protection for engineering problems (PO1), analyze problems related to engineering sciences (PO2) and design solutions to meet the specific needs (PO3). They apply research based knowledge of suitable equipment for performing specific testing on power system (PO4) and learn the skills (PO5). Understand engineering principles(PO11) of suitable equipment for performing specific testing on Protection schemes and the need for lifelong learning (PO12). Students could analyze compensation devices (PSO1), integrate the power system for the sustainability (PSO2)and contribute for the development of smart power grid (PSO3).

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LESSON PLAN DOCUMENT & LESSON PLAN EXECUTION

Course	: BE(EEE)	Academic Year	: 2019-2020
Subject Name	: Marine Electrical Protection and Switch Gears	Semester	: VII
Subject Code	: UAEE704	Group	:
LP Prepared by	: Dr.D.Lakshmi	LP Approved by	: Dr.T.Sasilatha
Designation	: Asso.Professor	Designation	: Prof & Dean
Date	: 19.07.2019	Date	: 22.07.2019

Unit No : I

Unit Title : **Introduction**

Learning Objective : To learn the importance of power system protection

LESSON PLAN DOCUMENT					LESSON PLAN EXECUTION		
S. No	Topics to be covered	Time (Hr)	Teaching Method	Flipped Class Activity (FCA)	Start Date	End Date	Signature
1	Principles and need for protective schemes	1	WB/PPT		26/7/19	26/7/19	
2	Nature and causes of faults	1	WB/PPT		27/7/19	27/7/19	
3	Types of faults	1	WB/PPT		29/7/19	29/7/19	
4	Fault current calculation using symmetrical components	2	WB/PPT	MCQ	30/7/19	2/8/19	
5	Power system earthing	1	WB/PPT		5/8/19	5/8/19	
6	Zones of protection and essential qualities of protection	2	WB/PPT		6/8/19	9/8/19	
7	Protection scheme	1	WB/PPT		13/8/19	13/8/19	

*Teaching Method – WB- White Board,Computer Assisted Teaching (CAT), Field Study

Flipped Class Activity – Product/Process demo,Group Discussion, Quiz, MCQ, Animation/Simulation Video, NPTEL Video, Video Conf /Virtual Class, Field study, Group Assignment with Web Exploration, Mini-Project,etc.,

Text books and Reference books are as given in syllabus.

Planned hours : 9 Executed hours: Variance : 9

Justification : –

Monitored by DEAN/HOD/Course in Charge

Controlled Copy

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LESSON PLAN DOCUMENT & LESSON PLAN EXECUTION

Course	: BE(EEE/M)	Academic Year	: 2018-2019
Subject Name	: Marine Electrical Protection and Switch Gears	Semester	: VII
Subject Code	: UAEE704	Group	:
LP Prepared by	: Dr.D.Lakshmi	LP Approved by	: Dr.T.Sasilatha
Designation	: Asso.Professor	Designation	: Prof & Dean
Date	: 19.07.2019	Date	: 22.07.2019

Unit No : II
Unit Title : **Operating Principles and Relay Constructions**
Learning Objective : To learn about the different types of relay constructions

LESSON PLAN DOCUMENT					LESSON PLAN EXECUTION		
S. No	**Topics to be covered**	**Time (Hr)**	**Teaching Method**	**Flipped Class Activity (FCA)**	**Start Date**	**End Date**	**Signature**
1	Electromagnetic Relays	2	WB/PPT		14/8/19	14/8/19	
2	Over Current Relay	2	WB/PPT		16/8/19	19/8/19	
3	Directional Relay	2	WB/PPT		24/8/19	26/8/19	
4	Distance and Differential Relays	1	WB/PPT	Nptel video	26/8/19	26/8/19	
5	Under frequency relays	1	WB/PPT		27/8/19	27/8/19	
6	Static relays	1	WB/PPT		30/8/19	30/8/19	

*Teaching Method – WB- White Board, Computer Assisted Teaching (CAT), Field Study
Flipped Class Activity – Product/Process demo,Group Discussion, Quiz, MCQ, Animation/Simulation Video, NPTEL Video, Video Conf /Virtual Class, Field study, Group Assignment with Web Exploration, Mini-Project,etc.,
Text books and Reference books are as given in syllabus.

Planned hours 9 : Executed hours 9 : Variance : 0
Justification : -

Monitored by DEAN/HOD/Course in Charge

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LESSON PLAN DOCUMENT & LESSON PLAN EXECUTION

Course	: BE(EEE)M)	Academic Year	: 2018-2019
Subject Name	: Marine Electrical Protection and Switch Gears	Semester	: VII
Subject Code	: UAEE704	Group	:
LP Prepared by	: Dr.D.Lakshmi	LP Approved by	: Dr.T.Sasilatha
Designation	: Asso.Professor	Designation	: Prof & Dean
Date	: 19.07.2019	Date	: 22.07.2019

Unit No : III
Unit Title : **Apparatus Protection**
Learning Objective : To learn about the various electrical equipments protection

LESSON PLAN DOCUMENT					LESSON PLAN EXECUTION		
S. No	Topics to be covered	Time (Hr)	Teaching Method	Flipped Class Activity (FCA)	Start Date	End Date	Signature
1	Transformer Protection	1	WB/PPT		19/8/19	19/8/19	
2	Generator, Motor Protection	2	WB/PPT		20/8/19	21/8/19.	
3	Protection Of Bus Bars	2	WB/PPT		26/8/19	30/8/19.	
4	Transmission Lines Protection	1	WB/PPT		9/10/19	09/10/19	
5	CTs and PTs and their applications in protection schemes	2	WB/PPT		09/10/19	10/10/19	
6	Cables Suitable for use in locations subject to high temperatures with oil mist or vapour	1	PPT	MCQ	19/10/19.	19/10/19.	

*Teaching Method – WB- White Board, Computer Assisted Teaching (CAT), Field Study
Flipped Class Activity – Product/Process demo,Group Discussion, Quiz, MCQ, Animation/Simulation Video, NPTEL Video, Video Conf /Virtual Class, Field study, Group Assignment with Web Exploration, Mini-Project,etc.,
Text books and Reference books are as given in syllabus.

Planned hours : 9 Executed hours : 9 Variance : 0
Justification : –

Monitored by DEAN/HOD/Course in Charge

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LESSON PLAN DOCUMENT & LESSON PLAN EXECUTION

Course	: BE(EEE)M)	Academic Year	: 2018-2019
Subject Name	: Marine Electrical Protection and Switch Gears	Semester	: VII
Subject Code	: UAEE704	Group	:
LP Prepared by	: Dr.D.Lakshmi	LP Approved by	: Dr.T.Sasilatha
Designation	: Asso.Professor	Designation	: Prof & Dean
Date	: 19.07.2019	Date	: 22.07.2019

Unit No : IV
Unit Title : **Theory of Circuit Interruption**
Learning Objective : To learn about arc quenching techniques

LESSON PLAN DOCUMENT					LESSON PLAN EXECUTION		
S. No	**Topics to be covered**	**Time (Hr)**	**Teaching Method**	**Flipped Class Activity (FCA)**	**Start Date**	**End Date**	**Signature**
1	Physics of arc phenomena and arc interruption	1	WB/PPT		14/10/19	14/10/19	
2	Re-striking voltage & Recovery voltage	1	WB/PPT		14/10/19	14/10/19	
3	Rate of rise of recovery voltage	1	WB/PPT		17/10/19	17/10/19	
4	Resistance switching	1	WB/PPT		18/10/19	18/10/19	
5	Current chopping	1	WB/PPT		19/10/19	19/10/19	
6	Interruption of capacitive current	2	WB/PPT		21/10/19	21/10/19	
7	DC circuit breaking	2	WB/PPT	MCQ	22/10/19	22/10/19	

*Teaching Method – WB- White Board, Computer Assisted Teaching (CAT), Field Study
Flipped Class Activity – Product/Process demo,Group Discussion, Quiz, MCQ, Animation/Simulation Video, NPTEL Video, Video Conf /Virtual Class, Field study, Group Assignment with Web Exploration, Mini-Project,etc.,
Text books and Reference books are as given in syllabus.

Planned hours 9 Executed hours 9 Variance : 0
Justification :

Monitored by DEAN/HOD/Course in Charge

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LESSON PLAN DOCUMENT & LESSON PLAN EXECUTION

Course	: BE(EEE(M))	Academic Year	: 2018-2019
Subject Name	: Marine Electrical Protection and Switch Gears	Semester	: VII
Subject Code	: UAEE704	Group	:
LP Prepared by	: Dr.D.Lakshmi	LP Approved by	: Dr.T.Sasilatha
Designation	: Asso.Professor	Designation	: Prof & Dean
Date	: 19.07.2019	Date	: 22.07.2019

Unit No : V

Unit Title : **Circuit Breakers**

Learning Objective : To learn about different types of Circuit Breakers

LESSON PLAN DOCUMENT					LESSON PLAN EXECUTION		
S. No	Topics to be covered	Time (Hr)	Teaching Method	Flipped Class Activity (FCA)	Start Date	End Date	Signature
1	Types of Circuit Breakers	2	WB/PPT		29/10/19	1/11/19	
2	Air Circuit Breaker	2	WB/PPT		2/11/19	4/11/19	
3	SF6 Breaker	1	WB/PPT		5/11/19	5/11/19	
4	Vacuum circuit breaker	1	WB/PPT		8/11/19	8/11/19	
5	Merits of different circuit breakers	1	WB/PPT		11/11/19	11/11/19	
6	Testing of circuit breakers	2	WB/PPT	MCQ	12/11/19	13/11/19	

*Teaching Method – WB- White Board, Computer Assisted Teaching (CAT), Field Study

Flipped Class Activity – Product/Process demo,Group Discussion, Quiz, MCQ, Animation/Simulation Video, NPTEL Video, Video Conf /Virtual Class, Field study, Group Assignment with Web Exploration, Mini-Project,etc.,

Text books and Reference books are as given in syllabus.

Planned hours 9 Executed hours 7 Variance : 0
Justification :

Monitored by DEAN/HOD/Course in Charge,

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

ACTIVITY BASED LEARNING		
Program & Batch: B.E (EEEM) &9	Semester/Year: VII/IV	Academic Year:2019-2020Batch: 9
Course Title: Marine Electrical Protection and Switchgear	Course Code: **UBEE704**	Faculty in charge: Dr.D.Lakshmi

S.NO	UNIT NO	TOPIC	NAME OF THE ACTIVITY	LINK/ PROOF	DATE AND TIME	No OF STUDENTS PRESENT	MAPPED COS
1.	I	Basics of Protection	Video Lecture	https://youtu.be/FsV4a2VPokQ	27/07/19 10.55A.M	19/28 = 68%	CO 1
2.	II	Electromagnetic Relay	Demo video	https://www.youtube.com/watch?v=cunddFiQzrk	26/08/19 2.20 P.M	20/28 = 71%	CO 2
3.	III	Transformer Protection	Animation Video	https://www.youtube.com/watch?v=qhl5ZEKegXc	22/10/19 10:55 A.M	22/28 = 79%	CO 3
4.	IV	Current Chopping	Nptel Video	https://www.youtube.com/watch?v=JRv2RVyYMtM	11/11/19 1:30 P.M	23/28 = 82%	CO 4
5.	V	Working of Circuit Breaker	Animation Video	https://www.youtube.com/watch?v=GSh0f94JwaA	15/11/19 11:50 A.M	28/28 = 100%	CO 5

Dr. T. SASILATHA, M.E., Ph.D.
Dean - EEE
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135, East Coast Road,
Kanathur-603112, Chennai, India.

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING			
Programme & Batch: B.E EEEM -9			Semester: VII
Course Title: Power System Protection and Switchgear			Course Code: UDEE701
Assignment no: I			Max Marks : 100
Deadline for submission of solutions by students: 22.10.2019			
SI No	**Assignment Question**	**Mapped CO's**	**Bloom's Level (K1 – K6)**
1	Explain in details about different methods of earthing with suitable diagram	CO1	K4
2	Discuss about the basic requirement of relays placed	CO1	K5
3	Determine the inductance of Peterson coil to be connected between the neutral and ground to neutralize the charging current of overhead line having line to ground capacitive of 0.15μf. If the supply frequency is 50Hz and operating voltage is 132KV, find the KVA rating of the coil.	CO2	K5
4	A 30 MVA, 11 KV generator has Z1= Z2=j0.21p.u and Z0=j0.05p.u. If a line to line fault occurs on the terminals of the generator, find the line current and line to neutral voltage under fault condition.	CO2	K4

Faculty In-Charge PAC HoD/Dean

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Dean - EEE
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135, East Coast Road,
Kanathur-603112, Chennai, India.

MARINE ELECTRICAL PROTECTION

AND SWITCH GEAR

ASSIGNMENT - I

Name: M. Dineshkumar

Rollno: EE302

Dept: BE(EEE) marine

Date: 22-10-2019

1) Different types of earthing

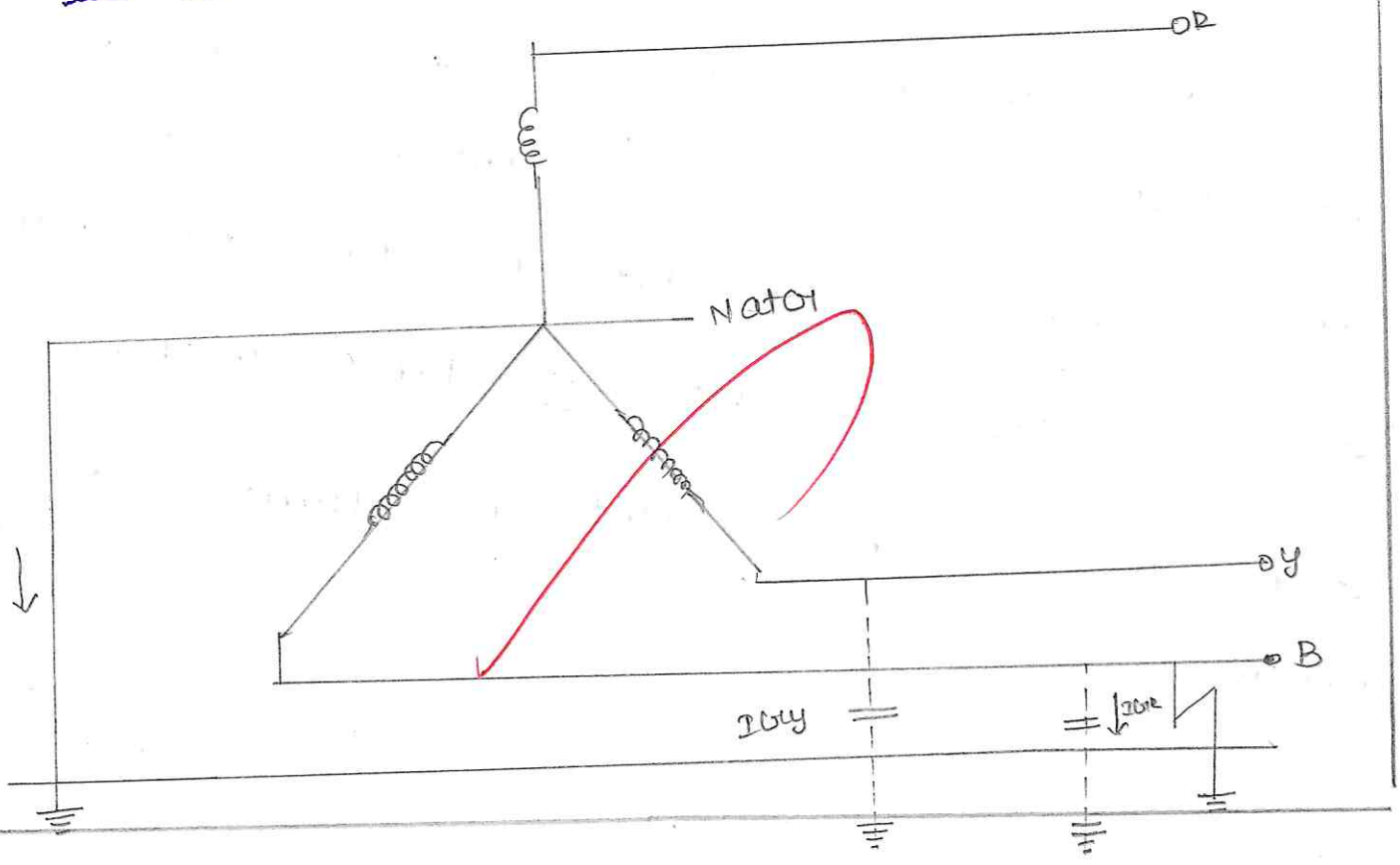
The different types of grounding used in the system are

undrounded system.

this system is used no more the neutral is not connected to earth it is also called insulated neutral system.

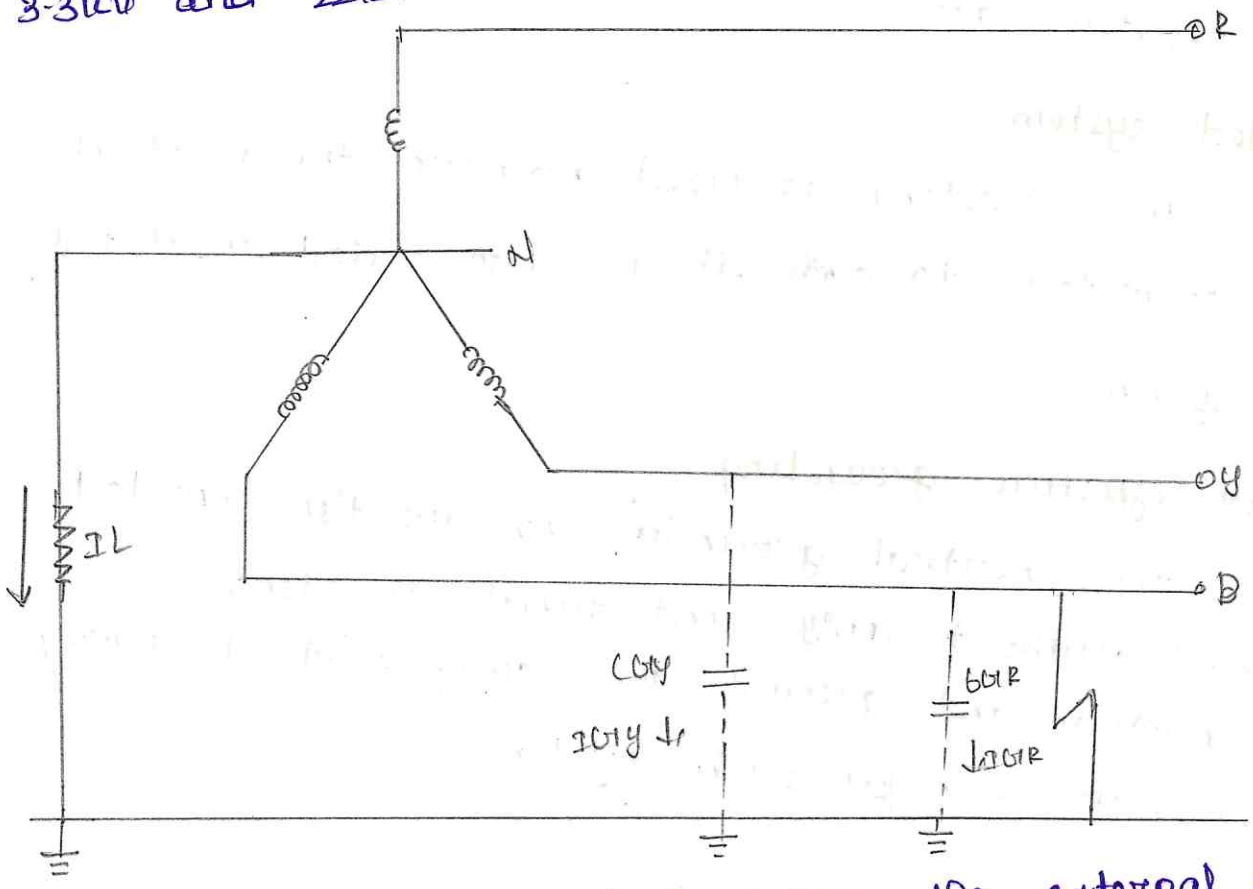
solid or effective grounding

the neutral grounding is directly connected to ground without any intentional impedence between neutral and ground the co-efficient of earthing is less than 80% for such system



Resistance earthing

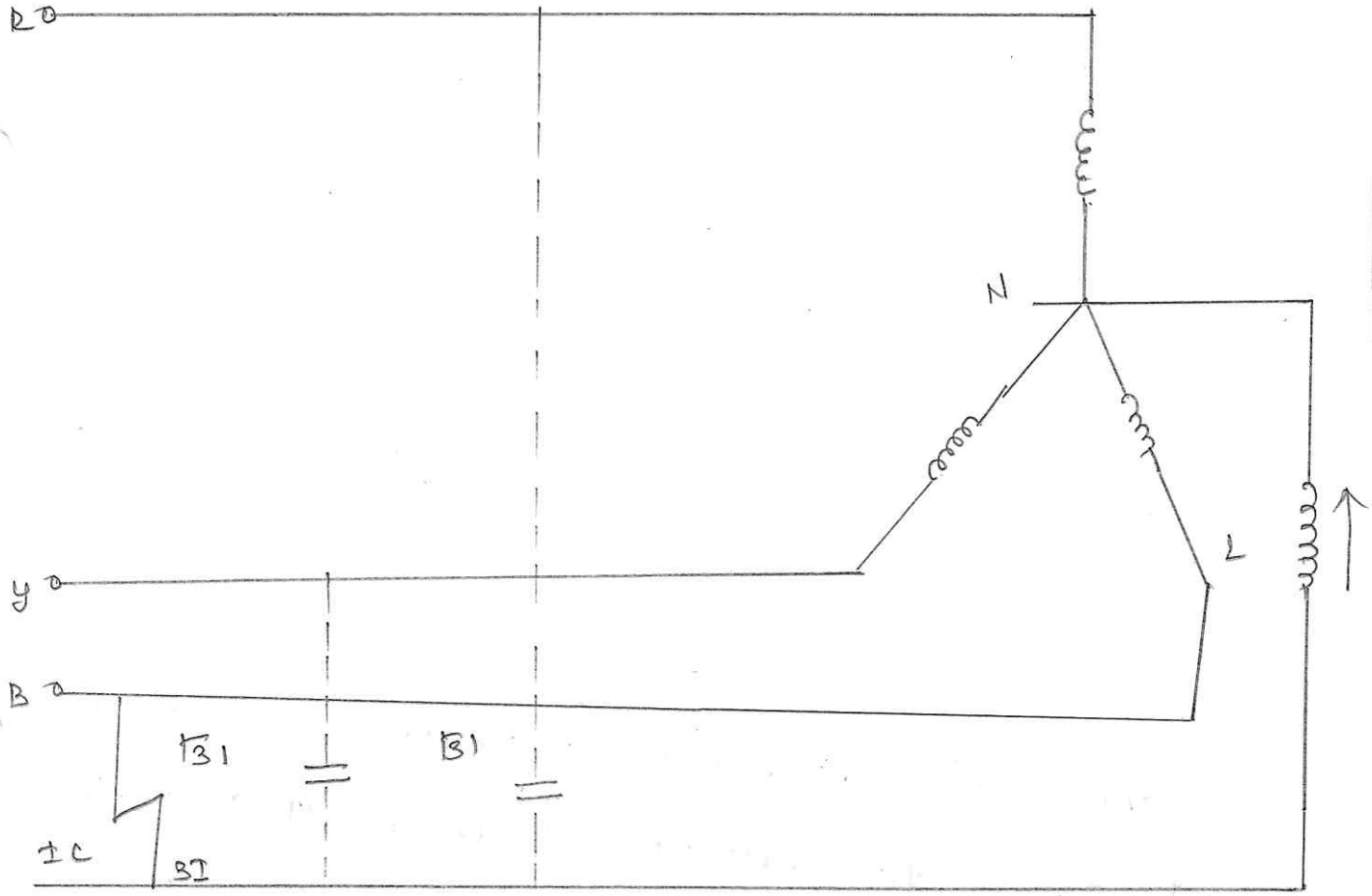
In order to limit the fault current one are more resistance are connected between neutral and earth it is mostly used in circuit between 3.3kv and 22kv



the circuit below 3.3kv the external resistance in neutral circuit is unneccessary because the voltage available between line and earth is only 230v. If earth resistance is 1.5ohm then the each current is limited to 230/1.5.

reatance earthing

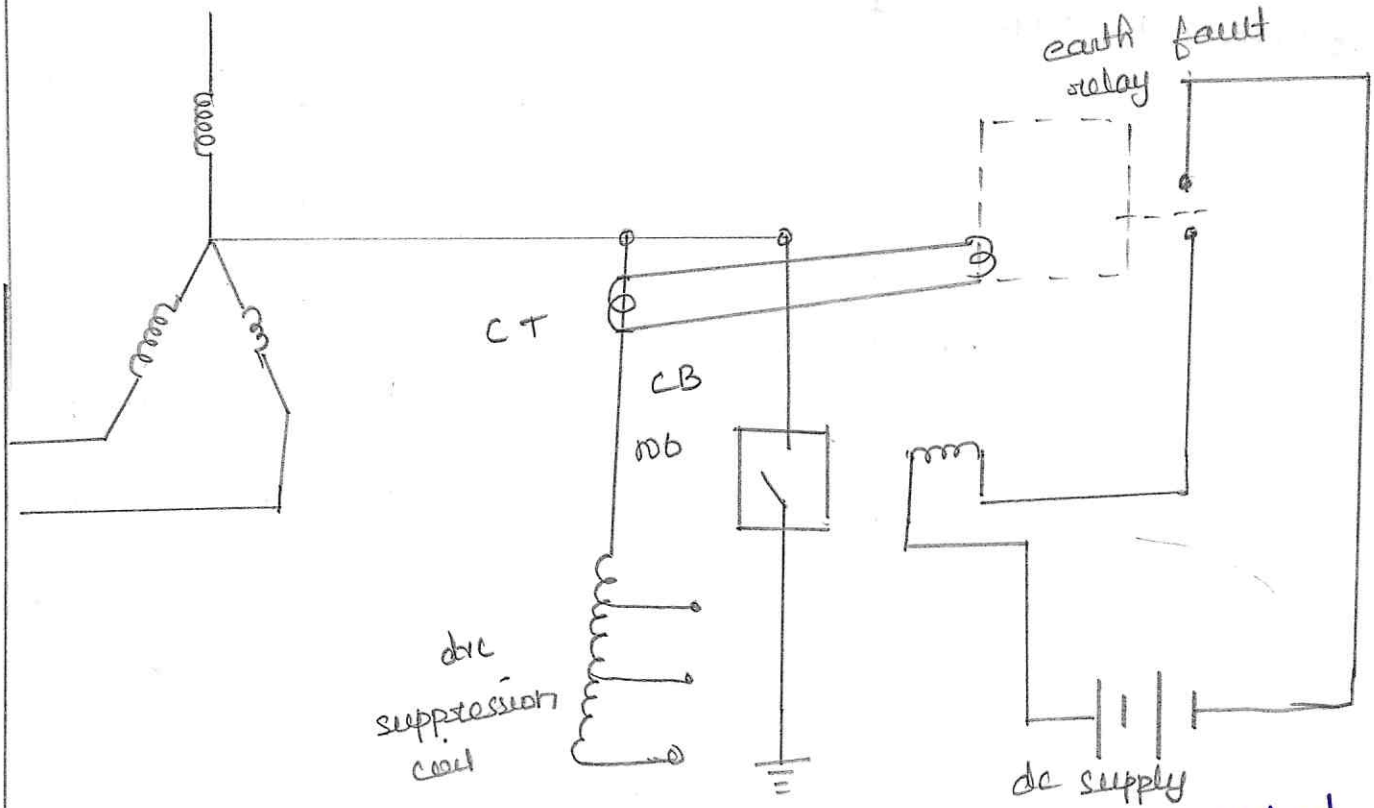
the reactance grounding provides additional reactance there by the capacitive current are neutralized hence for circuit where high charging currents are involved such as transmission line underground cables etc



If resistance is used fault current is limited and system reactance provides the necessary phase opposition between capacitive ground current and fault current.

Resonant grounding

It is also refferred as arc suppression coil grounding it consists of a coil called arc suppression coil provided with tappings connected between neutral and ground.



The coil is rated at continuous rated current equal to maximum earth fault current however if a speed earth fault occurs a circuit breaker closes after a certain time lag and the earth fault current flows through the parallel circuit by passing the arc suppression coil.

(i) Basic requirements of protective relaying

- speed
- selectivity
- sensitivity
- reliability
- simplicity
- economy

Speed

improves the stability of the power system

decrease the amount of damage caused

decrease the possibility of development of one type of fault into other more serve type.

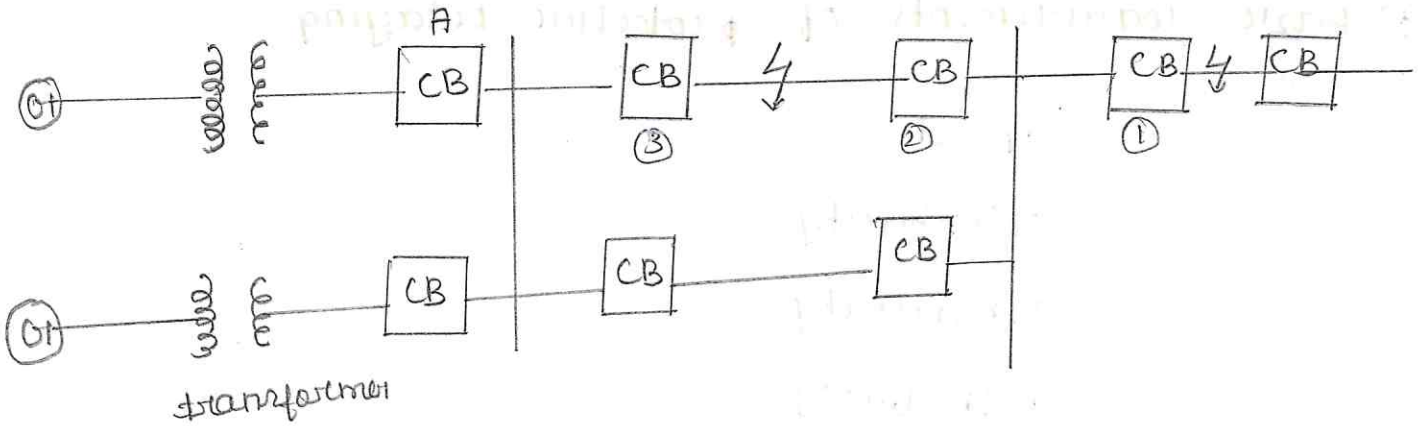
permits the use of rapid reclosure of circuit breakers to restore service to consumers

(ii) selectivity

The relay should be able to detect the point at which the fault occurs and cause the opening of the circuit breakers closed to the fault with minimum or no damage to the system

(iii) sensitivity

It is the ability of the relay system to operate with low value of actuating quantity.



The relay should be sensitive to operate when the fault current exceed

$$\text{Ks} = \frac{I_s}{I_o}$$

Ks = sensitivity factor

I_s = minimum short circuit current in the zone

I_o = minimum operating current for the protection.

(iv) Reliability

It is the ability of the relay system to operate under the pre-determined condition the failure of the protective system may be value to the failure of any of the element of the system viz protective relay circuit breaker PT CT battery etc

v) simplicity

the relaying system should be simple so that it can be easily maintained it is closely related with the reliability the simpler the protection scheme. the greater will be its a reliability

vi) Economy.

the protection scheme is the economic aspect the cost of the system should be within limits of the equipments to be protected is of most importance economic constraints can be released

a) $\vec{IR} = \vec{IR1} + \vec{IR2} + \vec{IR0}$

b) $\vec{IY} = \vec{IY1} + \vec{IY2} + \vec{IY0}$

c) $\vec{IB} = \vec{IB1} + \vec{IB2} + \vec{IB0}$

3) quality of protection

the system can be divided into the following protection

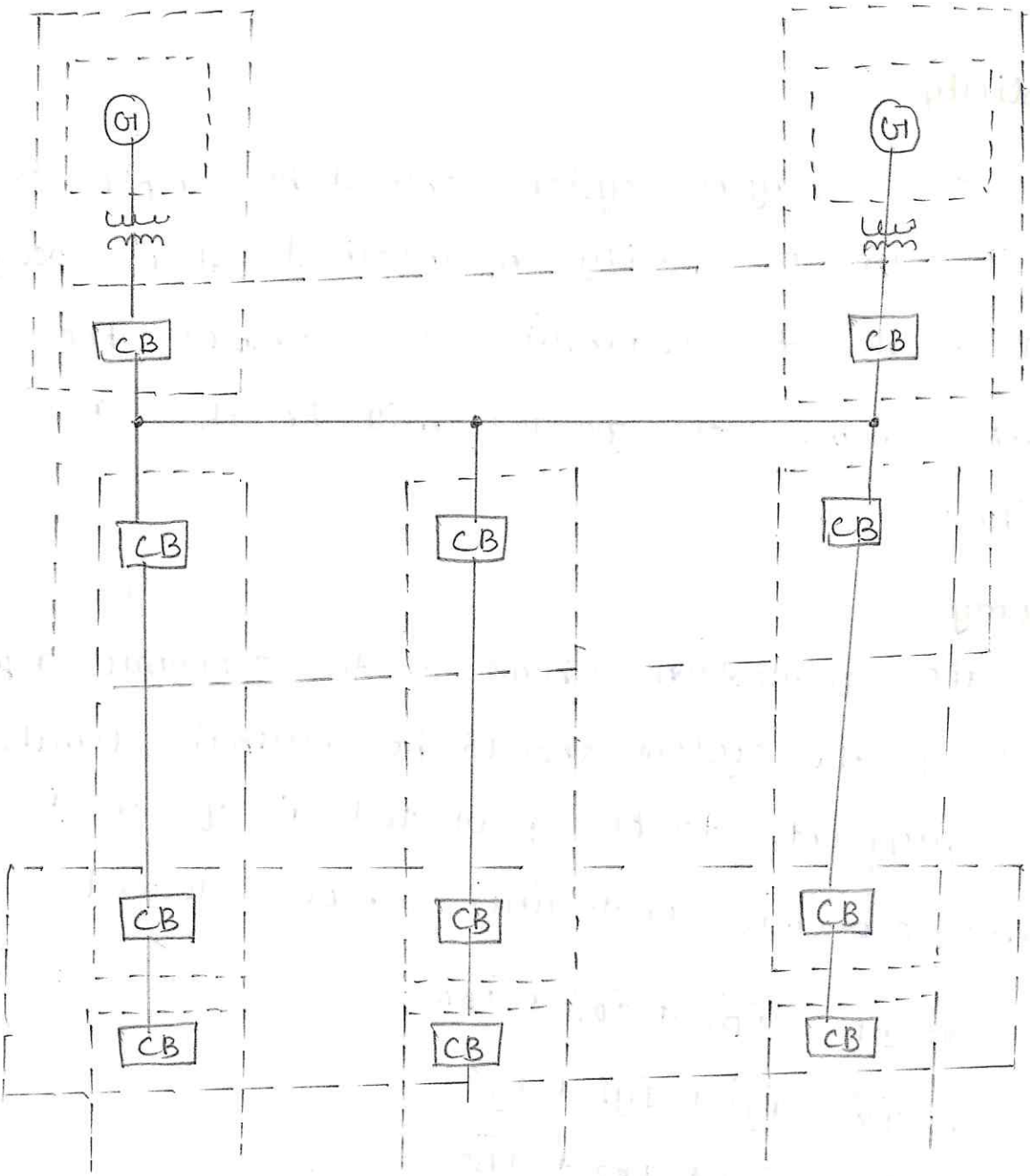
generators

Low tension switch gear

transformers

high tension switch gear

transmission lines



The protection provided by the protective relaying equipment can be classified

primary protection

backup protection

If the primary protection fails the backup protection comes into action and removes the fault part from the healthy system

failure in circuit breaker

failure in protective relay

failure in DC tripping voltage

failure in tripping circuit

loss of voltage or current supply.

Thus if no backup protection and the main protection fails then there is possibility of source damage to the system from the cost and economy point of view, the back up protection is employed only for the protection against short circuit and not for any other abnormal conditions

Rated Secondary Current of C.T = 5A

Pickup Current = 5 * 1.25

= 6.25 A

Fault Current in relay coil

$$= 4000 \times \frac{5}{400}$$

= 50 A

Plug setting multiplier = $\frac{50}{6.25} = 8$

In case of Peterson coil

$$L = \frac{1}{3\omega^2 C}$$

$$\omega = 2\pi f$$

$$= 2\pi (50)$$

$$= 100\pi$$

$$= 3.14 \cdot 99 \text{ rad/s}$$

$C = 0.15 \mu F = 0.15 \times 10^{-6} F$

Inductance $L = \frac{1}{3 \times (3.14)^2 \times (0.15 \times 10^{-6})}$

= 22.51 H.

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
CONTINUOUS ASSESSMENT TEST-1

Programme & Batch: B.E (EEEM) -9 **Year/Semester: IV / VII**

Course Name: Marine Electrical Protection and Switch Gears **Course Code: UAEE704**

Duration :1 hr 40 Minutes **Maximum** : 50 marks

Instructions:

1. Before attempting any question paper, be sure that you got the correct question paper.
2. The missing data, if any, may be assumed suitably.
3. Use the sketches wherever necessary.

CO1: Understand the need of protection schemes and types of faults in power system.
CO2:Understand the working of a relay and its types in detail

Qn.NO	Question	Marks	K level	CO
	SECTION A – (6 x 2 = 12 marks) **(Answer ALL questions)**			
1.	Define protective zone.	2	K1	CO1
2.	Define Switchgear.	2	K1	CO1
3.	Give the necessity of earthing.	2	K2	CO1
4.	How the relays are basically classified?	2	K1	CO2
5.	What is meant by directional relay?	2	K1	CO2
6.	Define burden of a relay.	2	K1	CO2
	SECTION B – (1 x 10 = 10 marks) **(Compulsory Question)**			
7.	Discuss in detail about different protection schemes.	10	K2	CO1
	SECTION C – (2 x 14 = 28 marks) **(Answer ALL questions)**			
8.(a).	Describe the essential qualities of a protective relaying	14	K4	CO1
	(or)			
8.(b).	Explain different types of earthing the neutral point of the power system. Derive an expression for the reactance of the Peterson coil in terms of capacitance of the protected line	14	K4	CO1
9.(a).	With neat diagram explain the construction and operation of induction type directional overcurrent relay.	14	K3	CO2
	(or)			
9.(b).	With the necessary sketch, Discuss in detail about electromagnetic attraction and Induction type relays.	14	K2-K6	CO2

Marks obtained

45 / 50

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(Under Section 3 of UGC Act 1956)

S.Venkatesh

CAT I / II EXAMINATION

NAME: S.VENKATESH, EE319

REG. NO: AEE16023, EE319

PROGRAMME: B.E(EEE) Marine

SEMESTER: 7th Sem, IVth year

COURSE CODE & NAME: Marine Electrical protection and switch gear (UAEE704)

DATE: 05/09/2019

No. of Pages Written: Addition (1)

Session: FN AN

Part A				Part B		Part C			
Q.No.	Marks	Q.No.	Marks	Q.No.	Marks	Q.No.	Marks	Q.No.	Marks
1	2	4	2	7	9	8.a	12½	9.a	12½
2	2	5	2			8.b		9.b	
3	2	6	0						

Total Marks in Words: Four five

Name & Signature of the Examiner: (D. LAKSHMI)

Cat I (PSh)

Section => (A)

Answer all Question:-

1) Protective zone:-

=> The protective zone is the separate zone, when the fault occurs, it will tripping in the circuit breaker, which is protective the device in the system. It is called as protective zone.

2) Switch gear

=> The switch gear is the

Marks obtained

37 / 50

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S. Dharun

CAT I / II EXAMINATION

NAME ..... S. Dharun ..... REG. NO ..... AEE16005 .....

PROGRAMME ..... EEE (marine) ..... SEMESTER ..... VII .....

COURSE CODE & NAME Marine Electrical Protection & Switchgears DATE ..... 5-9-19 .....

No. of Pages Written : Session: FN | AN

Part A				Part B		Part C			
Q.No.	Marks	Q.No.	Marks	Q.No.	Marks	Q.No.	Marks	Q.No.	Marks
1	1	4	12	7	8	8.a	12	9.a	12
2	1/2	5	1			8.b		9.b	
3	1	6							

Total Marks in Words ..... Three Seven .....

Name & Signature of the Examiner Dhy

SECTION-B

7. protection schems:-

The protection schems is the protect the fault in the some earthing switch that can be based on the so many type of fault

Type of faults:-

There are two type of fault, that is Contain the three phase faults.

* Symmetrical faults
* Unsymmetrical faults.

It Contain the fault to protection the fault

Continuous Internal Assessment Mark View

Course	B.E. - Electrical and Electronics Engineering-Marine	Batch	BE(EEEM)-9
Semester	7	Group	1
Subject	UBEE704 - Marine Electrical Protection and Switch Gears	Assessment Type	CAT 1

S.No	Roll No	Reg No	Student Name	Marks
1	REE290	AEE15028	VIGNESH M	0.0
2	EE297	AEE16001	ABIRAJ.B	84.0
3	EE298	AEE16002	AVINASH VIJAY	80.0
4	EE299	AEE16003	AZARUTHEEN S	52.0
5	EE300	AEE16004	BEER MOHAMED UVAIZ. N	88.0
6	EE301	AEE16005	DHARUN.S	74.0
7	EE302	AEE16006	DINESH KUMAR.M	60.0
8	EE303	AEE16007	GANESHBABU K	54.0
9	EE304	AEE16008	GOKULAKRISHNAN.B	0.0
10	EE305	AEE16009	IMMANVEL PETER	68.0
11	EE306	AEE16010	JOEL ROBINSON	74.0
12	EE308	AEE16012	KARTHI. P	50.0
13	EE309	AEE16013	KRISHNARAJ.S	52.0
14	EE310	AEE16014	MOHAN RAJ R	68.0
15	EE311	AEE16015	NAVEEN RAJ. R	62.0
16	EE312	AEE16016	PUNNOOSE BENNY	74.0
17	EE314	AEE16018	ROHIT KUMAR	0.0
18	EE315	AEE16019	SAMUEL MATHEW.G	50.0
19	EE316	AEE16020	SNAHASISH SAHA	92.0
20	EE318	AEE16022	SURIYA R	56.0
21	EE319	AEE16023	VENKATESH S	90.0
22	EE320	AEE16024	VIGNESH.B	50.0
23	EE322	AEE16025	IVAN CELIO ALVES MAYER	0.0
24	EE323	AEE16026	SREERAG SREEKUMAR	50.0
25	EE324	AEE16027	PRAVEEN.D	56.0
26	EE325L	AEE16028L	AKASH S	88.0
27	EE326L	AEE16029L	ANITOSH MONDAL	86.0
28	EE327L	AEE16030L	SANTHOSH KUMAR D	52.0
29	EE328L	AEE16031L	VAITHIYANATHAN M S	74.0
30	EE321L	AEE16032L	SRI RAM SURATH.KUMAR. V	62.0
31	EE376L	AEE16033L	SURYA .A	60.0

D Lakshmi

(Dr. D. LAKSHMI)
Asso. Prof

ANNA UNIVERSITY (UNDER SECTION 3 OF UGC ACT 1956) Dept. of Electrical and Electronics Engineering (Marine)

Continuous Internal Assessment - Analysis and Corrective Actions

Course	B.E. – EEEM	**Batch**	B.E(EEEM)-9
Semester	7	**Group**	1
Subject	UEE704- Marine Electrical Protection and Switch Gears	**Test**	CAT 1

Total No. of Students	31
No. of Students Appeared	27
No. of Students Absent	4
No. of Students Passed	27
No. of Weak Students	0

Distributed Marks

Range	0 - 9	10 - 19	20 - 29	30 - 39	40 - 49	50 - 59	60 - 69	70 - 79	80 - 89	90 - 99	100
No. of Students	0	0	0	0	0	10	6	4	5	2	0

Weak Students List [Secured Marks less than 50.0]

S.No	Roll No	Reg No	Name

Root Cause Analysis:

-

Corrective Action Taken:

-

Faculty Signature

HOD's Signature

Dr. T. SASILATHA, M.E., Ph.D.
Dean - EEE
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135, East Coast Road,
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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING			
Programme & Batch: B.E EEEM -16			Semester: VII
Course Title: Power System Protection and Switchgear			Course Code: UDEE701
Assignment no: II			Max Marks : 100
Deadline for submission of solutions by students:			
SI No	**Assignment Question**	**Mapped CO's**	**Bloom's Level (K4 – K6)**
1	A star connected, 3 phase, 10 MVA, 6.6 kV alternator has a per phase reactance of 10%. It is protected by Merz-price circulating current principle which is set to operate for fault currents not less than 175A. Calculate the value of earthing resistance to be provided in order to ensure that only 10% of the alternator winding remains unprotected.	CO3	K4
2	Show the MHO relay characteristic on the R-X diagram. Discuss the range setting of various distance relays placed on a particular location	CO3	K5
3	Explain the block diagram of negative sequence relay.	CO4	K3
4	Discuss about Merz Price differential protective relay.	C04	K4

Faculty In-Charge PAC HoD/Dean

Dr. T. SASILATHA, M.E., Ph.D.
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ACADEMY OF MARITIME EDUCATION AND TRAINING

Assignment - II

Marine Electrical protection and Switch gear

Name : K. GANESHBABU

Roll no: EE303

Course: BE (EEE) Marine

Subject: Marine Electrical protection and Switch gear

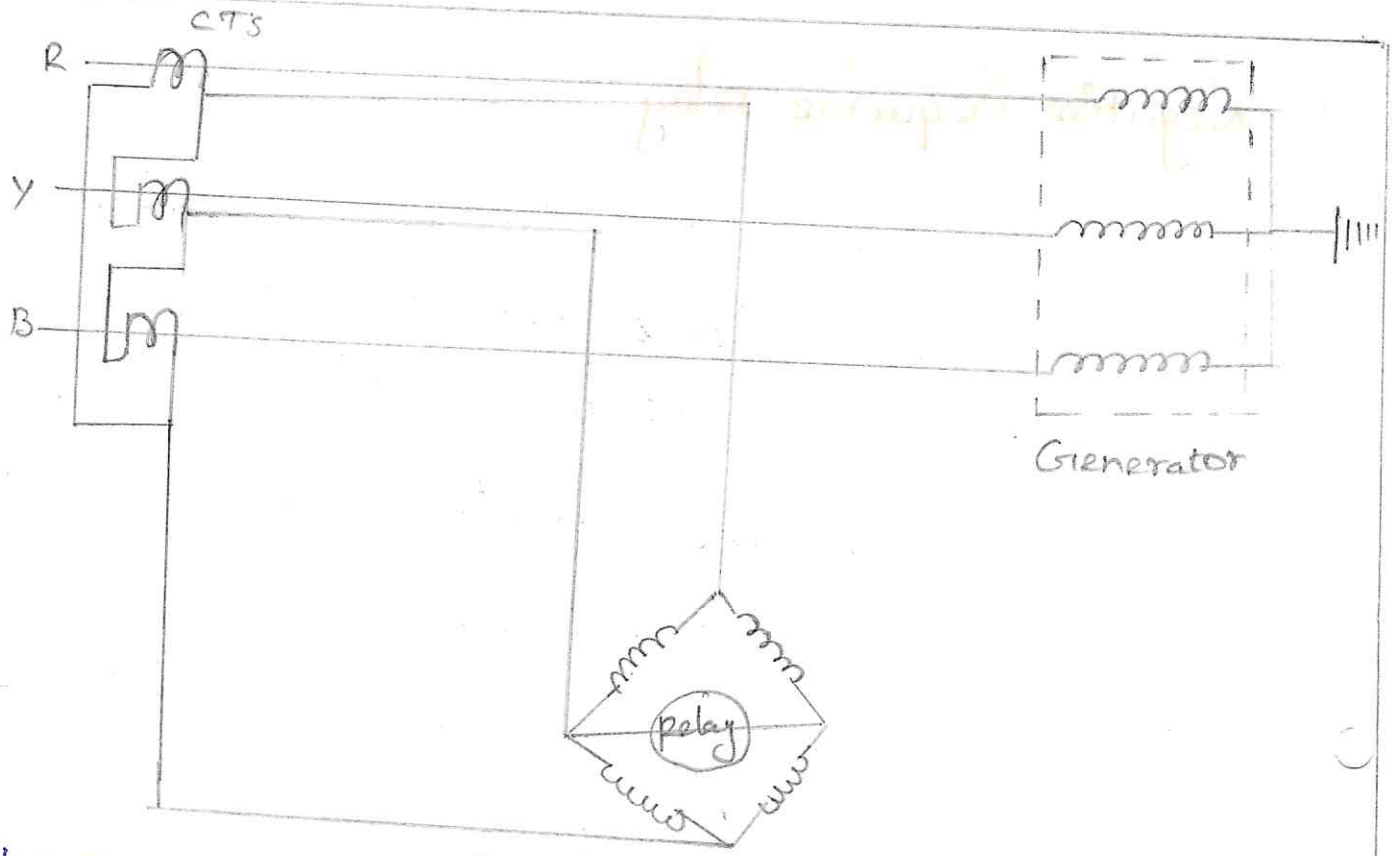
1. Negative Sequence relay

Negative Sequence relay are used to protect electrical machines against overheating due to unbalance current in stator

These unbalance currents cause heating of rotor and damage it unbalance three phase current have negative sequence components These components rotate at synchronous speed in a direction opposite to the direction of the rotation of rotor inducing double frequence current in the rotor

The arrangement of negative sequence relay connection The relay is connected in parallel across the current a transformer Secondaries.

under normal condition Equal current flow all the three phases their algebraic in zero.



Hence no current flow through the relay but if unbalancing occurs the secondary currents will be different and resultant current flows

The negative sequence relay has the inverse square law characteristic

$$I_2^2 t = K \text{ a constant}$$

I_2 is the negative sequence component

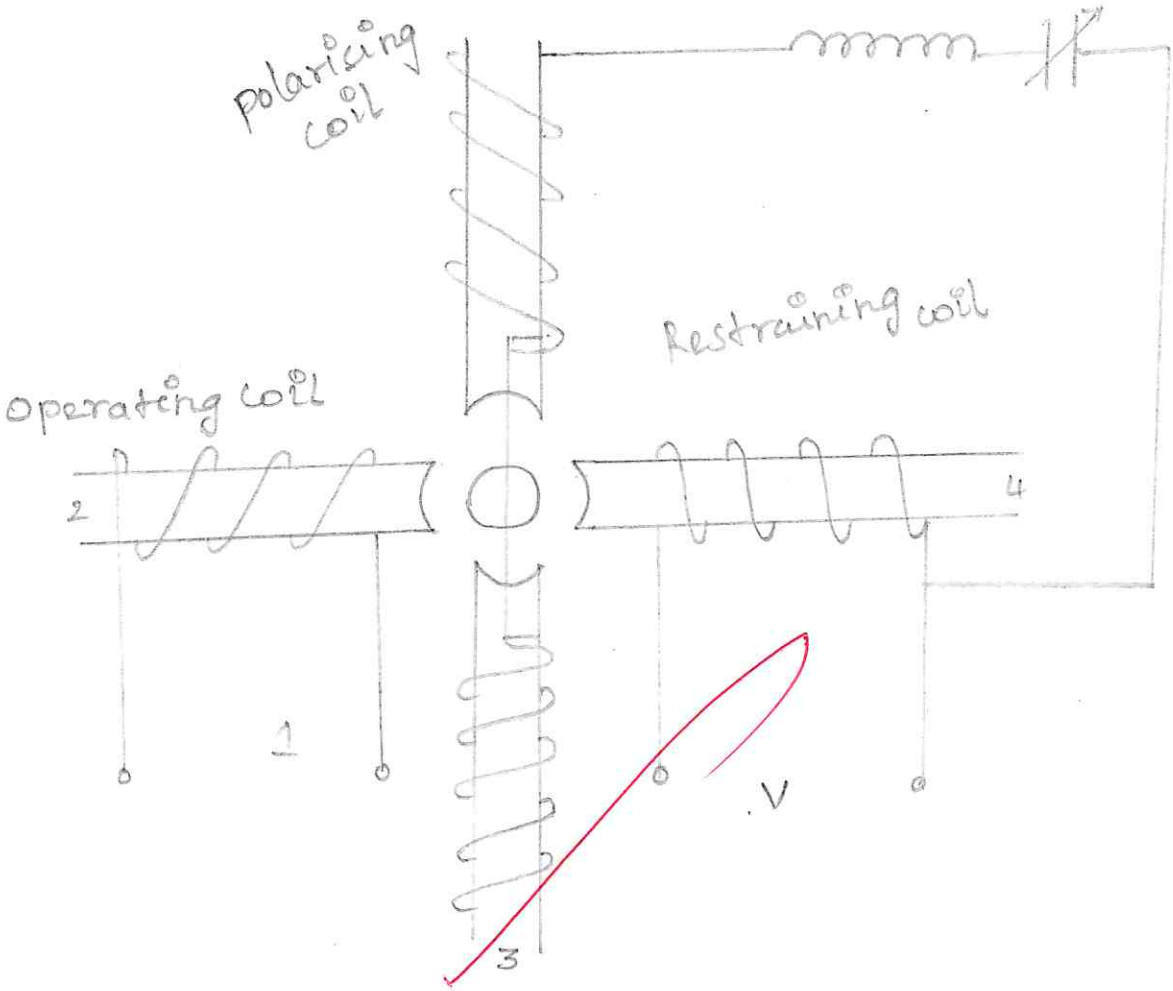
$$t = K/I_2^2 \quad \text{ie, } t \propto 1/I_2^2$$

2. Mho relay or Admittance relay

The mho relay is similar in principle to an impedence relay but is made inherently directional by the addition of a voltage winding known as polarising winding

Construction

A simple form of electromagnetic induction type mho relay



Thus an admittance relay is a voltage restrained directional relay

The torque equation is given by

$$T = K_1 V I \cos(\phi - \alpha) - K_2 V - K_3$$

The upper and lower poles are energised by a voltage V to produce a polarising flux The capacitor Connector in Sources providing memory action

The left pole flux due to current I interacts with the polarised flux due to V to produce the operating torque

$$K_1 V I \cos(\phi - \alpha)$$

The angle α can be varied by adjusting the resistance in the phase shifter circuit provided on the left pole

A mho relay measures a component admittance $y<0$ But its characteristics Plotted on the R-X diagram is a circle Passing through the origin as It is inherently a directional relay as it detects the fault

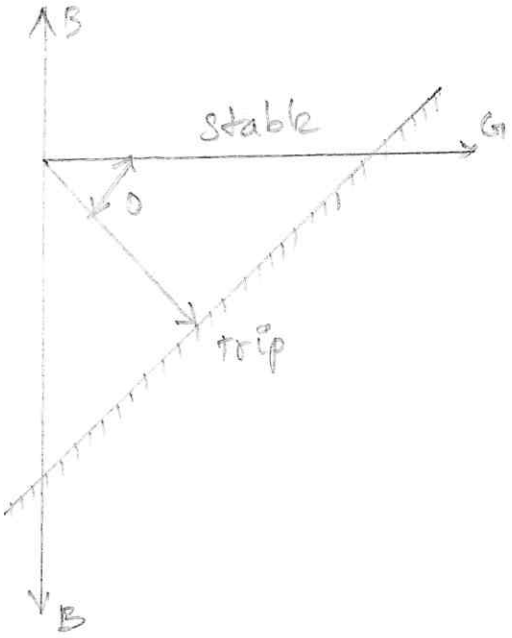
Mho relay characteristics expression

$$T = K_1 V I \cos(\phi - \alpha) - K_2 V^2 - K_3$$

Neglecting the effect of the spring (K_3)

$$K_2 V^2 < K_1 V I \cos(\phi - \alpha)$$

$$K_2 V < K_1 I \cos(\phi - \alpha)$$



$$\frac{V}{I\cos(\phi-\alpha)} < \frac{K_1}{K_2}$$

(or)

$$\frac{V}{I} < \frac{K_1}{K_2}\cos(\phi-\alpha)$$

(or)

$$Z < \frac{K_1}{K_2}(\cos(\phi-\alpha))$$

The balance conditions

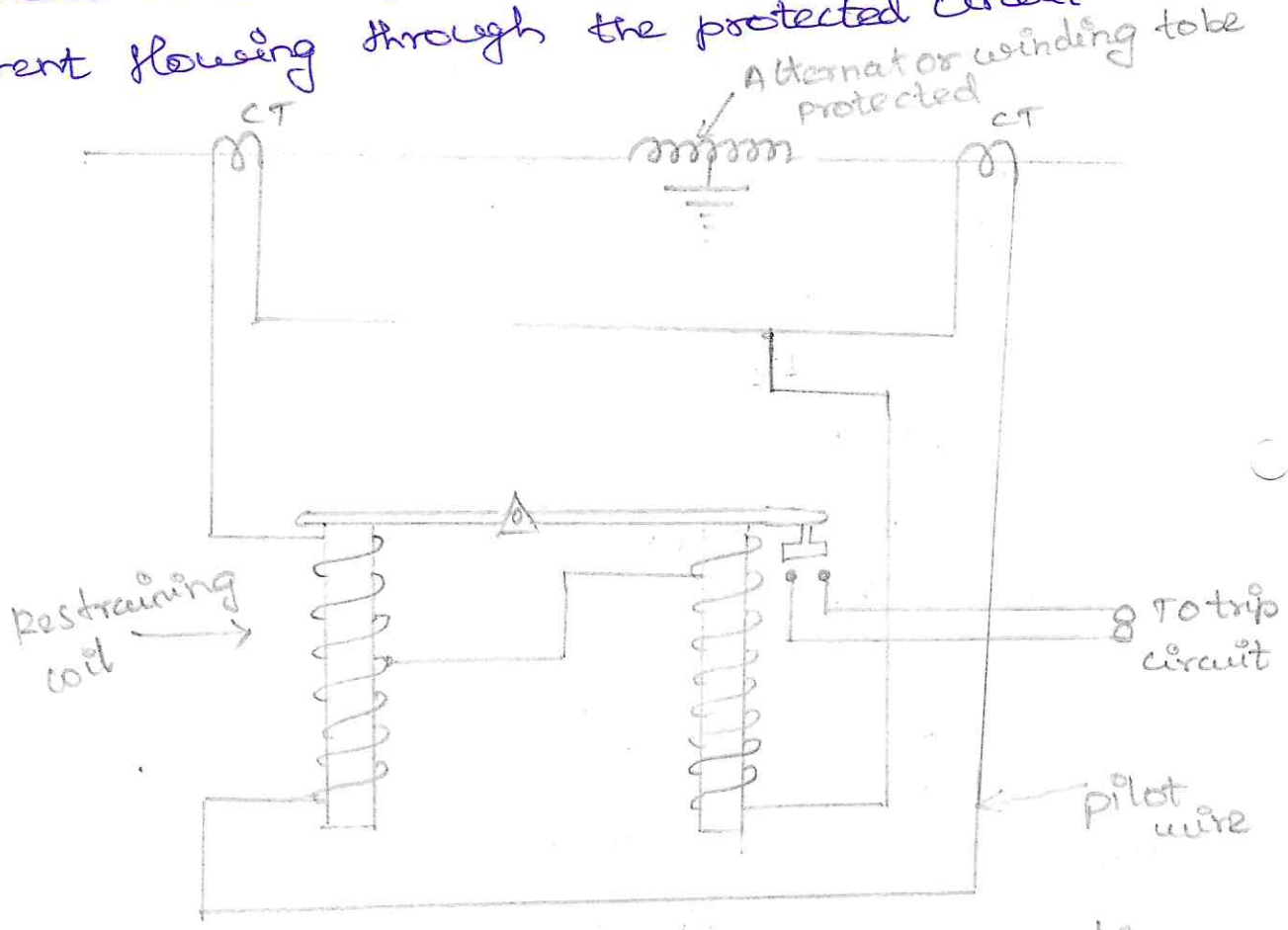
$$K_1 V_1 \cos(\phi-\alpha) = K_2 V^2$$

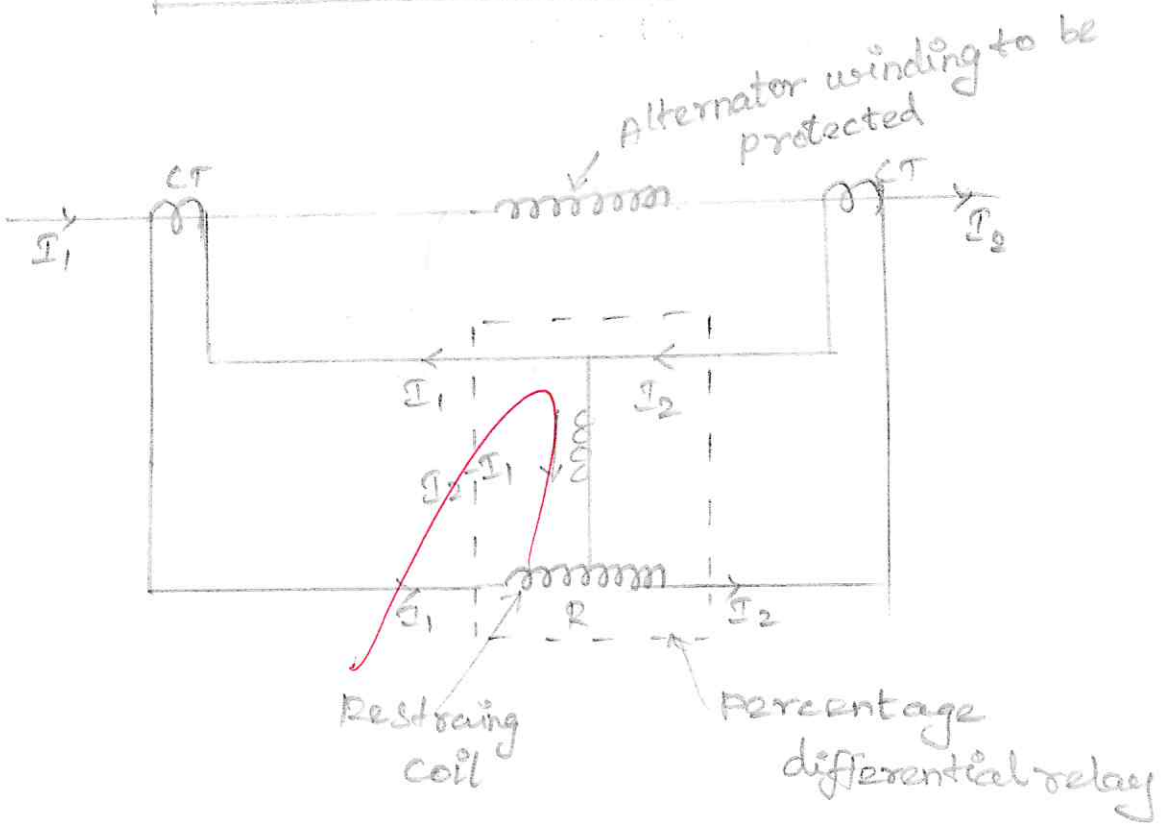
$$\frac{I}{Z} = \frac{K}{\cos(\phi-\alpha)} = Y$$

$$Y = \frac{K}{\cos(\phi-\alpha)} : \text{admittance in mho}$$

3. Merz-price protection Differential relay

This relay is designed to operate to the differential current interms of its fractional relation with actual current flowing through the protected circuit

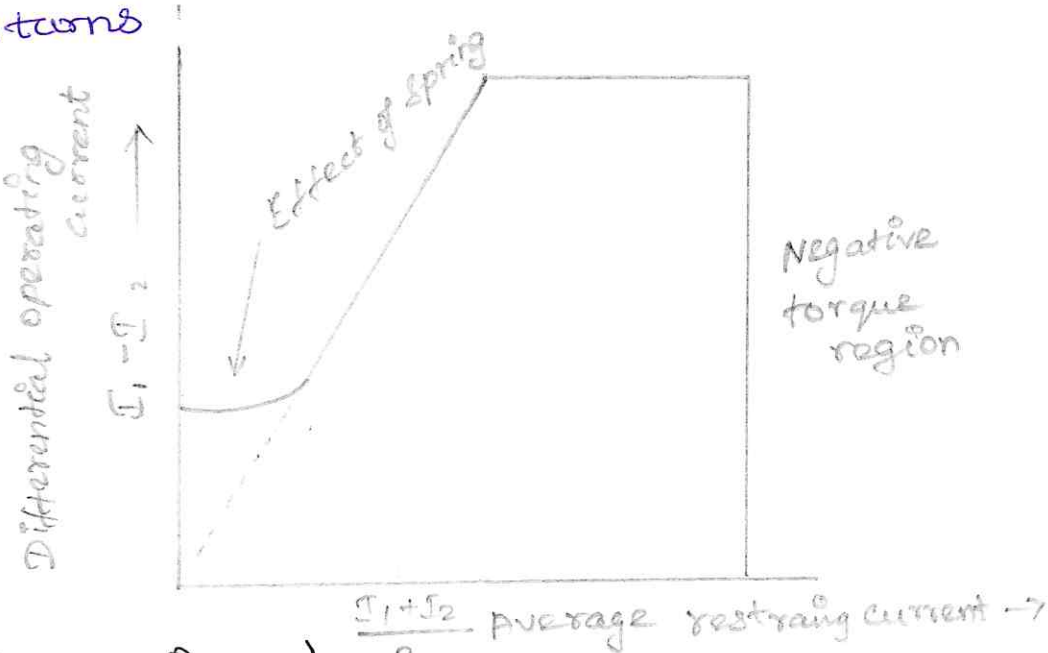




The operating coil is connected to midpoint of the restraint coil connected The total number of ampere turns became the sum of ampere

$$I_1 N/2 + I_2 N/2$$

which gives the average restraining current of $\frac{I_1 + I_2}{2}$ in N turns



Settings of Merz price relay

It has two principle setting

* Setting of operating coil current
* Setting of restraining coil circuit

The percentage setting of operating coil is defined as the ratio of smallest current in operating coil to cause operation to the rated current of the operating coil

V_L = 10KV, R = 10Ω, CT ratio = 1000/5 = 1.8A

I_0 = minimum operating line current

$$= I_0 \times \frac{1000}{5} = 1.8 \times \frac{1000}{5}$$

$$= 360A$$

V = line to neutral voltage

$$= \frac{V_L}{\sqrt{3}} = \frac{10 \times 10^3}{\sqrt{3}} = 5773.5026V$$

% winding unprotected $= \frac{R I_0}{V} \times 100$

$$= \frac{10 \times 360}{5773.5026} \times 100$$

$$= 62.3538\%$$

It is necessary to give 80% protection

% winding unprotected = 100 − 80

= 20%

$$20 = \frac{R \times 360}{5773.5026} \times 100$$

$$R = 3.2075\Omega$$

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
CONTINUOUS ASSESSMENT TEST-2

Programme & Batch: B.E (EEEM) -9 **Year/Semester: IV / VII**

Course Name: Marine Electrical Protection and Switch Gears **Course Code: UAEE704**

Duration :1 hr 40 Minutes **Maximum** : 50 marks

Instructions:

1. Before attempting any question paper, be sure that you got the correct question paper.
2. The missing data, if any, may be assumed suitably.
3. Use the sketches wherever necessary.

CO3: Ability to understand and analyze Electromagnetic and Static Relays.
CO4: Ability to acquire knowledge on functioning of circuit breaker.

Qn.NO	Question	Marks	K level	CO
	SECTION A – (6 x 2 = 12 marks) (Answer ALL questions)			
1.	Why secondary of transformer should not be opened?	2	K2	CO3
2.	Why a neutral resistor is added between neutral and earth of an alternator?	2	K2	CO3
3.	List the types of bus bar protection.	2	K1	CO3
4.	Give the advantages of static relays.	2	K1	CO4
5.	Show the Duality between Amplitude and Phase Comparators.	2	K1	CO4
6.	What is phase comparator?	2	K2	CO4
	SECTION B – (1 x 10 = 10 marks) (Compulsory Question)			
7.	Explain the Merz-price circulation current scheme of protection used for power transformer.	10	K3	CO3
	SECTION C – (2 x 14 = 28 marks) (Answer ALL questions)			
8.(a).	Explain the types of protective schemes employed for the protection ofTransmission line.	14	K4	CO3
	(or)			
8.(b).	Explain in detail about various protection schemes employed in Generator.	14	K4	CO3
9.(a).	Explain in detail about the numerical Over current protection.	14	K3	CO4
	(or)			
9.(b).	Explain in detail about Static Relays and its types of Comparators.	14	K3	CO4

Marks obtained

47 / 50

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CAT I / II EXAMINATION

NAME S.VENKATESH REG. NO AEE16023, EE319

PROGRAMME B.E(EEE) Marine SEMESTER 7th

COURSE CODE & NAME Switch gear DATE

No. of Pages Written : Session: FN AN

Part A				Part B		Part C			
Q.No.	Marks	Q.No.	Marks	Q.No.	Marks	Q.No.	Marks	Q.No.	Marks
1	2	4	2	7	9	8.a	13	9.a	13
2	2	5	2			8.b		9.b	
3	2	6	2						

Total Marks in Words Four Seven

Name & Signature of the Examiner

Section - (A)

1) Open circuit in is C.T secondary if the primary circuit has current flowing the secondary circuit should never be opened. This can cause very big voltage to occur due to amperoturn of the primary function.

2) In order to limit the flow of current to neutral and causes a resistor is introduced between them over current and earth fault protection is the backup protection.

Continuous Internal Assessment Mark View

Course	B.E. - Electrical and Electronics Engineering-Marine	Batch	BE(EEEM)-9
Semester	7	Group	1
Subject	UBEE704 - Marine Electrical Protection and Switch Gears	Assessment Type	CIA 2

S.No	Roll No	Reg No	Student Name	Marks
1	REE290	AEE15028	VIGNESH M	0.0
2	EE297	AEE16001	ABIRAJ.B	64.0
3	EE298	AEE16002	AVINASH VIJAY	78.0
4	EE299	AEE16003	AZARUTHEEN S	72.0
5	EE300	AEE16004	BEER MOHAMED UVAIZ. N	88.0
6	EE301	AEE16005	DHARUN.S	76.0
7	EE302	AEE16006	DINESH KUMAR.M	86.0
8	EE303	AEE16007	GANESHBABU K	84.0
9	EE304	AEE16008	GOKULAKRISHNAN.B	78.0
10	EE305	AEE16009	IMMANVEL PETER	60.0
11	EE306	AEE16010	JOEL ROBINSON	72.0
12	EE308	AEE16012	KARTHI. P	68.0
13	EE309	AEE16013	KRISHNARAJ.S	68.0
14	EE310	AEE16014	MOHAN RAJ R	68.0
15	EE311	AEE16015	NAVEEN RAJ. R	84.0
16	EE312	AEE16016	PUNNOOSE BENNY	74.0
17	EE314	AEE16018	ROHIT KUMAR	0.0
18	EE315	AEE16019	SAMUEL MATHEW.G	66.0
19	EE316	AEE16020	SNAHASISH SAHA	62.0
20	EE318	AEE16022	SURIYA R	86.0
21	EE319	AEE16023	VENKATESH S	94.0
22	EE320	AEE16024	VIGNESH.B	50.0
23	EE322	AEE16025	IVAN CELIO ALVES MAYER	0.0
24	EE323	AEE16026	SREERAG SREEKUMAR	58.0
25	EE324	AEE16027	PRAVEEN.D	52.0
26	EE325L	AEE16028L	AKASH S	68.0
27	EE326L	AEE16029L	ANITOSH MONDAL	62.0
28	EE327L	AEE16030L	SANTHOSH KUMAR D	66.0
29	EE328L	AEE16031L	VAITHIYANATHAN M S	76.0
30	EE321L	AEE16032L	SRI RAM SURATH KUMAR. V	54.0
31	EE376L	AEE16033L	SURYA .A	52.0

for HoD/EEE

Dr. D. Lakshmi
Associate Prof.

Continuous Internal Assessment - Analysis and Corrective Actions

Course	B.E. – EEEM	**Batch**	B.E(EEEM)-9
Semester	7	**Group**	1
Subject	UEE704- Marine Electrical Protection and Switch Gears	**Test**	CAT 2

Total No. of Students	31
No. of Students Appeared	28
No. of Students Absent	3
No. of Students Passed	28
No. of Weak Students	0

Distributed Marks

Range	0 - 9	10 - 19	20 - 29	30 - 39	40 - 49	50 - 59	60 - 69	70 - 79	80 - 89	90 - 99	100
No. of Students	0	0	0	0	0	5	10	7	5	1	0

Weak Students List [Secured Marks less than 50.0]

S.No	Roll No	Reg No	Name

Root Cause Analysis:

-

Corrective Action Taken:

-

Faculty Signature

HOD's Signature

Dr. T. SASILATHA, M.E., Ph.D.
Dean - EEE
ACADEMY OF MARITIME EDUCATION AND TRAINING
(Declared as Deemed to be University u/s 3 of UGC Act 1956)
13[illegible] East Coast Road,
[illegible]

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING			
Programme & Batch: B.E EEEM -9			Semester: VII
Course Title: Power System Protection and Switchgear			Course Code: UDEE701
Assignment no: III			Max Marks : 100
Deadline for submission of solutions by students:			
SI No	**Assignment Question**	**Mapped CO's**	**Bloom's Level (K4 – K6)**
1	Explain the block diagram of SF6 Circuit Breaker	CO5	K3
2	Discuss about Vacuum Circuit Breaker	CO6	K4

Faculty In-Charge

PAC

HoD/Dean

Dr. T. SASILATHA, M.E., Ph.D.
Dean - EEE
ACADEMY OF MARITIME EDUCATION AND TRAINING
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135 East Coast Road,
Kanathur - 603112, Chennai, India.

Assignmet - III

Marine Electrical protection and Switch gear

Name: K. GANESHBABU

Course BE(EEE) MARINE

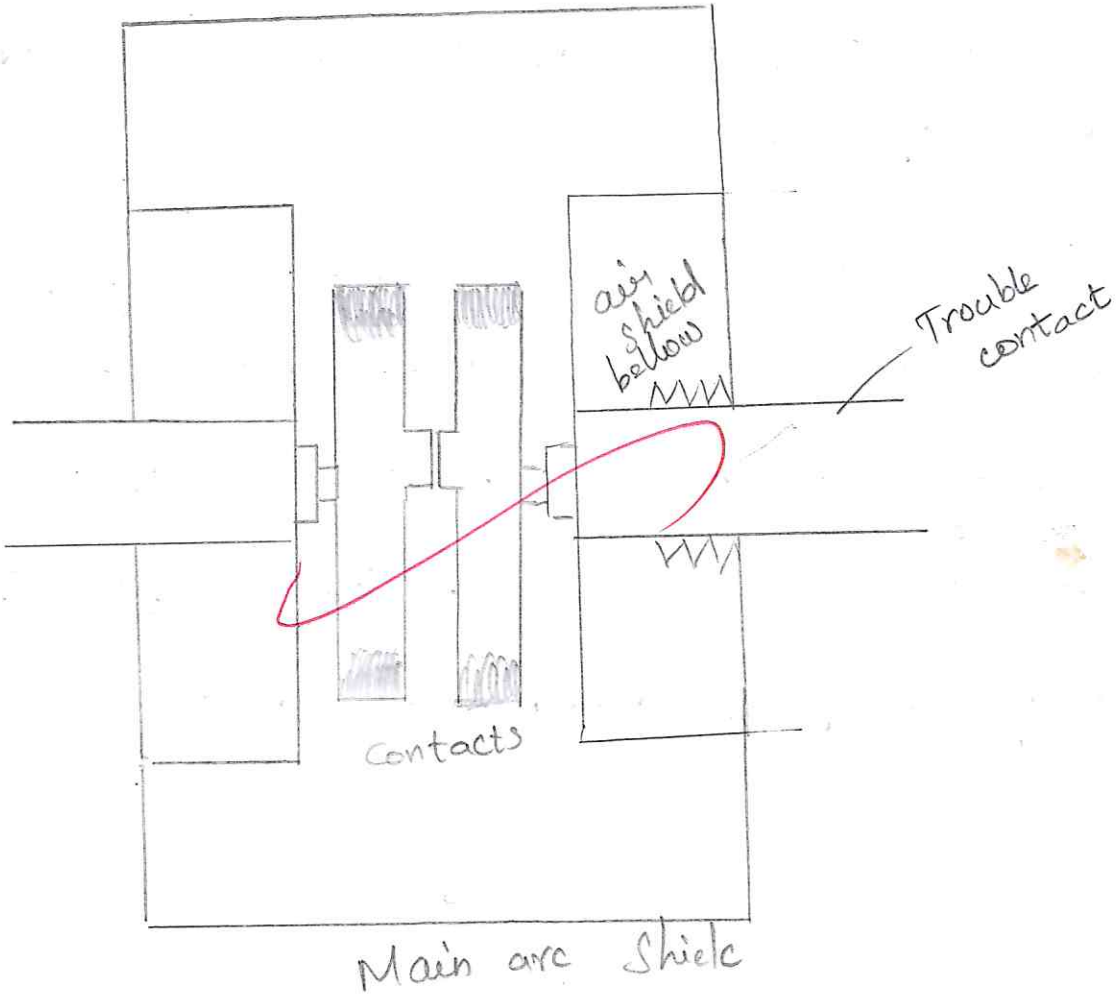
Rollno: EE303

Regno: AEE16007

1. Explain about SF_6 and Vacuum circuit breakers

Vacuum circuit breaker:

When the contacts of the breaker are opened in vacuum an arc is produced between the contacts by the ionization of the vapour of contact. However the arc is quickly energized because the metallic vapours electrons of ions produced during arc rapidly coincede on the surface of the breaker contact reacting in quick recovery of dielectric Strength



It consists of fixed contacts, moving contacts and arc shield mounted inside a vacuum chamber the moving member is connected to the control mechanism by stainless steel bellows This enables the permanent sealing of the vacuum chamber of eliminate the possibility of leak

The breaker operates the moving contact separates from the fixed contact and arc is struck between the contacts

The production of an arc is due to collision of match coins and depends very much upon the material of contact.

The arc is quickly energizes became the method vapour electronics and ion products during arc breaking differ in a short time and sensed by the surface of moving on fixed members arc shield

Advantage

* They are Compact in Size
* It have very longer life
* There are no fire hazards
* NO restriction on interpution of fault current
* NO generation of gas during and after operation
* They require less maintenance
* They can Successfully withstand lightining Surges
* They have low are energy

Disadvantage:

There is a erosion of material from electrodes as conduction if gas from the a electrons during Surging

Applications:

* outdoor installations ranging from 28KV to 66KV

Properties of SF_6 gas:

* Colourless odourless non torque
* Non inflammable
* gas is electronegative
* High heat transfer capacity
* liquification starts at low temperature
* Good dielectric distribution
* The dielectric SF_6 gas at atmosphere pressure is 2.9 intact of abt 30% less than that of dielectric oil.

Types of SF_6 circuit breakers

* Buffer type
* Double pressure SF circuit breaker

When the contacts of breaker are opened the volume mechanism presents a high pressure SF_6 gas from the due reservoir to follow towards the Interruption chamber

Cylindrical, hallow cylindrical with Current carrying with an ac horn is the fixed contact the moving contact is a hallow cylindrical with rectangular holes in the sides to permit SF_6 gas to let through the holes after flowing along and across the ax

The dept of flux Contact, moving Contact the across the wide copper tungsten and constable unnatural

operation

During the normal working conditions the contacts are in closed position when the contact open the ac is struck between them.

The movement of moving contact and opening the value are Synchronize together which permits high pressure SF_6 gas from reservior

The high pressure gas absorb the face electrons on the ac bar to form Immobile negative the gas also removes the heat from the arc due to this arc diameter decides end it becomes small Current zero with the turbulent flow around Current zero the arc is energized.

ASSIGNMENT

III

Name : M. Dineshkumar

Dept : BE (EEE) marine

Roll no : EE302

Subject : marine electrical protection and switch gear

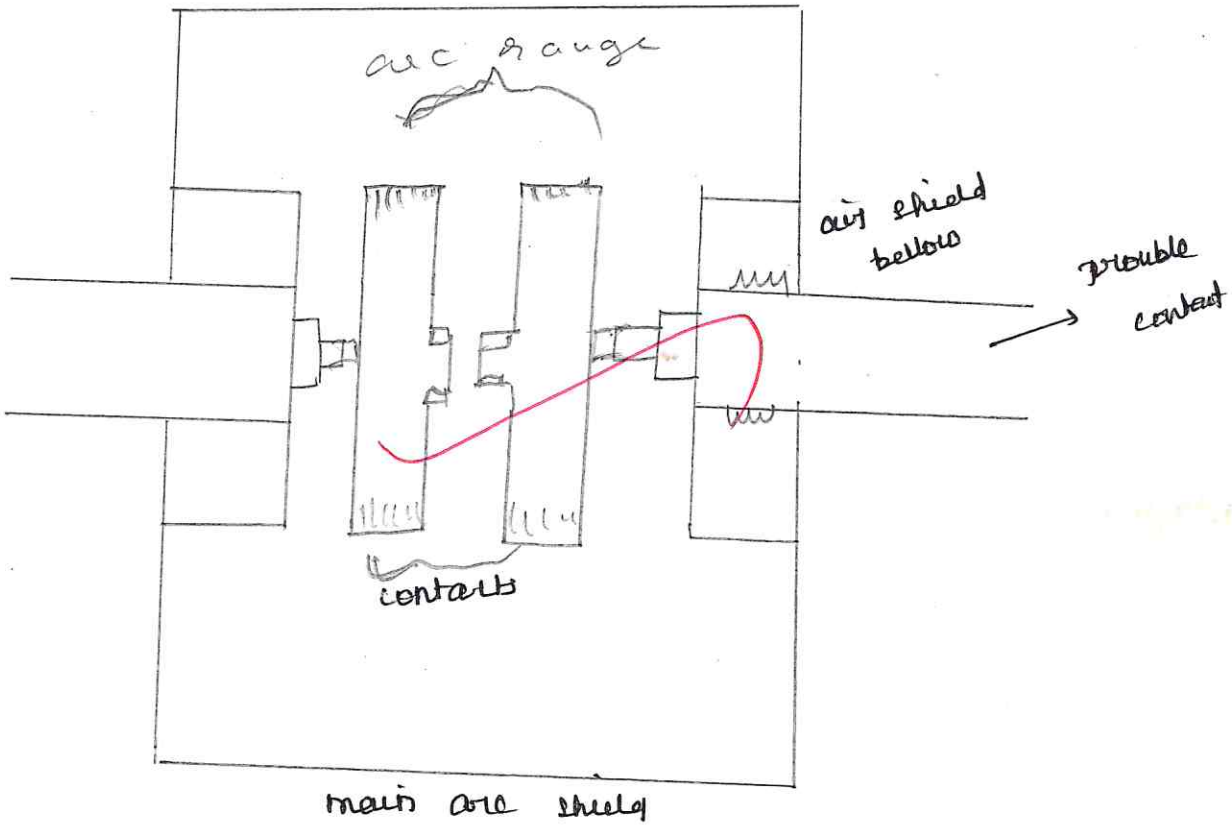
1) explain about SF6 and vaccum circuit breaker

vaccum circuit breaker

principle

when the contacts of the breaker one opened in vaccum an arc is produced between the contacts by the ionization of the match vapour of contacts however the ac is quickly energized a because the metallic vapour, electrons of ions produced during arc rapidly coincide one the surface of the breaker contact resulting in quick recover of dielectric strength

construction



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Lather the breaak operates the moving contact separates from the fixed contact and are in strike between the control.

The production of are is due to consideration of match coins and depends very much upon the material of contact.

the are is quickly energized became the method vapomes electronics and ions produced during are differing in a short time and sieved by the surface of moving on fixed members and shield.

Advantages:

They are compact in size

It have very longer life

There are no fire hazards

No restriction on interruption of fault current

No generation of gas during and after operation

They require less maintainance

They can successfully withstand lightening surges

They have low arc energy

They have low inertia and hence smaller power is required for control mechanism

dis-advantage

There is a erosion of material from a electrodes as conduction it gas from the arc electrones during surging.

Application:

out door installation ranging from 22kv to 66kv

properties of SF6 gas

colourless odourless non torque

non inflammable

gas is electromagative

high heat transfer capacity

high heat transmfer capacity

non heat content property

high density and heavy gas

Liquification starts at low temperature

the dielectric shough of SF6 gas at atmosphere pressure is 2.4 intact of air 30% less than that of dielectric oil

crood dielectric distribution

Types of SF6 CB:

puffer type

Double pressure SF circuit breaker

when the constant of breaker are opened the volume mechanism prosents or high pressure SF6 gas from due reservoir to follow towards the are interruption chamber

the dept of these fixed contact moving contact the across the coater with copper tungster and unistable unnatural.

operation :

During the normal working conditions the contacts are in closed position when the contacts are opened then are in strake between them. the movement of moving contacts and opening the value are synchronised together which permits high pressure SF6 gas from reservoir

the high pressure gas absorbs the free e electrode on the arc path to turn immobile negative the gas also removes the heat from the arc due to this arc diameter decreases and it becomes small current zero with the turbulet flow around current zero the arc is energized.

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MODEL EXAMINATIONS – OCTOBER 2019

Programme & Batch: BE – EEEM(2016 -2020 Batch) **Semester** : VII
Course Title : Marine Electrical Protection and Switch Gears **Course Code** : UAEE704
Duration : 3 Hours **Maximum** : 100 marks

Instructions:
1. Before attempting any question paper, be sure that you got the correct question paper.
2. The missing data, if any, may be assumed suitably
3. Use the sketches wherever necessary

CO1: Ability to find the causes of abnormal operating conditions of the apparatus and system.
CO2: Ability to suggest suitability circuit breaker.
CO3: Ability to understand and analyze Electromagnetic and Static Relays.
CO4: Ability to acquire knowledge on functioning of circuit breaker.
CO5: Ability to study about the apparatus protection, static and numerical relays.
CO6: Ability to analyze the characteristics and functions of relays and protection schemes.

Question No	Question	Mark	K Level (K1-K6)	(CO)
	Section A (10 * 2 = 20 Marks) Answer all Questions			
1	Define protective zone.	2	K1	CO1
2	Distinguish Symmetrical and Unsymmetrical fault.	2	K1	CO1
3	Summarize the functions of protective relays.	2	K1	CO2
4	Define differential relay?	2	K1	CO2
5	Classify the various bus bar faults.	2	K1	CO3
6	Explain over fluxing protection of a transformer?	2	K2	CO3
7	Differentiate Amplitude Comparator and Phase Comparator.	2	K2	CO4
8	Discuss static relay.	2	K1	CO4
9	Explain current chopping.	2	K1	CO5
10	List the methods of arc interruption.	2	K1	CO5
	Section B (1 * 10 = 10 Marks) Compulsory Question			
11	(i) A relay is connected to 400/5 ratio current transformer with current setting of 150%. Calculate the plug setting when circuit carries a fault current of 4000A	10	K3	CO 6
	(ii) Explain in detail about differential Relay.			

Section C (5 * 14 = 70 Marks) Answer All Questions

12	(a) What is grounding? Discuss in detail about the different types of Grounding.	14	K2	CO1
	(OR)			
12	(b). What is a fault? Give the nature, causes and types of fault. Briefly explain the fault current analysis using symmetrical components.	14	K2	CO1
13	(a).What is Universal torque equation? Using this equation derive the operating characteristics and RX diagram of (a) Reactance Relay (b) Impedance Relay (c) Mho Relay.	14	K2	CO2
	(OR)			
13	(b).With neat sketch, Explain in detail about Directional and Non-Directional Induction Overcurrent Relay.	14	K3	CO2
14	(a)Explain in detail about the role of Current transformer and potential transformer in protective scheme.	14	K3	CO3
	(OR)			
14	(b).Explain in detail about the role of Current transformer and potential transformer in protective scheme.	14	K3	CO3
15	(a). Discuss in detail about Numerical protection of transmission line and Transformer.	14	K2	CO4
	(OR)			
15	(b) .Explain in detail about the numerical Overcurrent protection.	14	K4	CO4
16	(a). With neat sketch, Explain the operation of SF6 and Vacuum circuit Breaker.	14	K4	CO5
	(OR)			
16	(b). What is Restriking voltage? Derive the expression for rate of rise of Restriking voltage. Explain in detail about Resistance switching.	14	K2	CO5

Knowledge Level as per Bloom Taxonomy
K1- Remember; K2- Understand; K3- Apply; K4- Analyse; K5- Evaluate; K6- Create

CO1, CO2, CO3, CO4, CO5 Indicates the Course Outcome in Unit 1, Unit 2, Unit 3, Unit 4 and Unit 5

Department of Electrical and Electronics Engineering
RUBRICS FOR ASSIGNMENT

	LEVELS OF PERFORMANCE			
LEVELS	**EXCELLENT (10 Marks)**	**GOOD (8 to 9 Marks)**	**SATISFACTORY (5 to 7 Marks)**	**NEEDS IMPROVEMENT (less than 5)**
Concept quality and relevance	High quality, correct and useful information presented in a clear and succinct form	Correct and mostly useful information presented in a clear and concise form	Information presented was mostly correct, concepts are difficult to follow	Little/ no information presented
Circuit Diagram/Block Diagram	Diagrams succinctly and logically conveyed the techniques and mechanism	Most of the Diagrams succinctly and logically conveyed the techniques and mechanism	Most of the Diagrams used to convey the technical information are inaccurate or unclear	Diagrams used did not convey the technical information due to the poor presentation.
Critical explanation	Topic was thoroughly and critically discussed in relation to underlying technical aspects	Topic was mostly discussed critically in relation to underlying technical aspects	Large sections discuss the topic or circuit with little integration	Most of the discussion of the underlying mechanism was not related to the topic or inappropriately linked
Method of Solving problems	Chosen efficient method that made sense, explained and get the correct answer	Chosen good strategies and get the correct answer	Chosen lengthy strategies and was confusing in few places	Chosen inappropriate method and did not get the correct answer
Presentation	Exceptionally well-presented and argued; ideas are detailed, well-developed, supported with specific evidence & facts, as well as examples and specific details.	Well-presented and argued; ideas are detailed, developed and supported with evidence and details, mostly specific.	Content is not sound and solid; ideas are present but not particularly developed or supported; some evidence, but usually of a generalized nature.	Needs to edit errors. Special attention should be given to write sentences.

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

EVALUATION FORM FOR ASSIGNMENT

Course Code & Name: UAEE704 / Marine Electrical Protection and Switch Gears

Program & Batch: B.E. EEE- M &9

Semester/ Year: VII /IV

Assignment No: I

S.no	Roll No.	Name of the Student	Concept quality and relevance	Circuit Diagram/Block Diagram	Critical explanation	Method of Solving problems	Presentation	Total Marks
			10	**10**	**10**	**10**	**10**	**50**
1	EE297	ABIRAJ.B	10	10	10	9	9	48
2	EE298	AVINASH VIJAY	8	9	8	7	7	39
3	EE299	AZARUTHEEN S	8	9	8	7	7	39
4	EE300	BEER MOHAMED UVAIZ. N	10	8	9	9	9	45
5	EE301	DHARUN.S	9	10	9	9	9	46
6	EE302	DINESH KUMAR.M	9	10	9	9	9	46
7	EE303	GANESHBABU K	9	9	10	9	10	47
8	EE304	GOKULAKRISHNAN.B	8	8	7	7	7	37
9	EE305	IMMANVEL PETER	8	9	8	7	7	39
10	EE306	JOEL ROBINSON	10	10	10	10	10	50
11	EE308	KARTHI. P	10	8	9	8	8	43
12	EE309	KRISHNARAJ.S	8	9	8	7	7	39
13	EE310	MOHAN RAJ R	9	10	9	9	9	46
14	EE311	NAVEEN RAJ. R	10	10	10	10	10	50

15	EE312	PUNNOOSE BENNY	8	9	8	7	7	39
16	EE315	SAMUEL MATHEW.G	8	9	8	7	7	39
17	EE316	SNAHASISH SAHA	10	10	10	10	10	50
18	EE318	SURIYA R	10	8	9	8	8	43
19	EE319	VENKATESH S	10	10	10	10	10	50
20	EE320	VIGNESH.B	9	10	9	9	9	46
21	EE323	SREERAG SREEKUMAR	10	10	10	10	10	50
22	EE324	PRAVEEN.D	10	10	10	10	10	50
23	EE325L	AKASH S	8	9	8	7	7	39
24	EE326L	ANITOSH MONDAL	9	10	9	9	9	46
25	EE327L	SANTHOSH KUMAR D	10	10	10	10	10	50
26	EE328L	VAITHIYANATHAN M S	10	8	9	8	8	43
27	EE321L	SRI RAM SURATH KUMAR. V	10	10	8	8	9	45
28	EE376L	SURYA .A	9	10	9	9	9	46

Faculty In-Charge **PAC** **Dean-EEE**

Dr. T. SASILATHA, M.E., Ph.D.
Dean - EEE
ACADEMY OF MARITIME EDUCATION AND TRAINING
(Declared as Deemed to be University u/s 3 of UGC Act.1956)
135, East Coast Road,
Kanathur - 603112, Chennai, India.

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

EVALUATION FORM FOR ASSIGNMENT

Course Code & Name: UAEE704 / Marine Electrical Protection and Switch Gears	**Program & Batch: B.E. EEE- M & 9**
Semester/ Year: VII /IV	**Assignment No: II**

S.no	Roll No.	Name of the Student	Concept quality and relevance	Circuit Diagram/Block Diagram	Critical explanation	Method of Solving problems	Presentation	Total Marks
			10	**10**	**10**	**10**	**10**	**50**
1	EE297	ABIRAJ.B	10	9	9	10	10	48
2	EE298	AVINASH VIJAY	8	7	8	7	7	37
3	EE299	AZARUTHEEN S	10	8	9	8	8	43
4	EE300	BEER MOHAMED UVAIZ. N	10	9	9	10	10	48
5	EE301	DHARUN.S	10	10	10	10	10	50
6	EE302	DINESH KUMAR.M	10	10	10	10	10	50
7	EE303	GANESHBABU K	10	8	9	8	8	43
8	EE304	GOKULAKRISHNAN.B	8	7	8	7	7	37
9	EE305	IMMANVEL PETER	8	8	7	9	8	40
10	EE306	JOEL ROBINSON	10	10	10	10	10	50
11	EE308	KARTHI. P	8	8	7	9	8	40
12	EE309	KRISHNARAJ.S	10	8	9	10	10	47
13	EE310	MOHAN RAJ R	10	10	10	10	10	50
14	EE311	NAVEEN RAJ. R	10	10	10	10	10	50

15	EE312	PUNNOOSE BENNY	8	9	8	7	9	41
16	EE315	SAMUEL MATHEW.G	8	7	8	7	7	37
17	EE316	SNAHASISH SAHA	10	10	10	10	10	50
18	EE318	SURIYA R	10	8	9	8	8	43
19	EE319	VENKATESH S	8	8	7	9	8	40
20	EE320	VIGNESH.B	8	7	8	7	7	37
21	EE323	SREERAG SREEKUMAR	10	10	10	10	10	50
22	EE324	PRAVEEN.D	10	8	9	10	10	47
23	EE325L	AKASH S	10	8	9	8	8	43
24	EE326L	ANITOSH MONDAL	8	9	8	7	9	41
25	EE327L	SANTHOSH KUMAR D	10	10	10	10	10	50
26	EE328L	VAITHIYANATHAN M S	8	8	7	9	8	40
27	EE321L	SRI RAM SURATH KUMAR. V	10	8	9	10	10	47
28	EE376L	SURYA .A	8	9	8	7	9	41

Faculty In-Charge

PAC

Dean-EEE

Dr. T. SASILATHA, M.E., Ph.D.
Dean - EEE
ACADEMY OF MARITIME EDUCATION AND TRAINING
(Declared as Deemed-to-be-University)

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(Under Section 3 of UGC Act 1956)

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

EVALUATION FORM FOR ASSIGNMENT

Course Code & Name: UAEE704 / Marine Electrical Protection and Switch Gears

Program & Batch: B.E. EEE- M & [illegible]

Semester/ Year: VII /IV

Assignment No: III

S.no	Roll No.	Name of the Student	Concept quality and relevance	Circuit Diagram/Block Diagram	Critical explanation	Method of Solving problems	Presentation	Total Marks
			10	10	10	10	10	50
1	EE297	ABIRAJ.B	10	10	10	10	10	50
2	EE298	AVINASH VIJAY	8	7	8	7	7	37
3	EE299	AZARUTHEEN S	10	8	9	10	10	47
4	EE300	BEER MOHAMED UVAIZ. N	10	10	10	10	10	50
5	EE301	DHARUN.S	8	8	7	9	10	42
6	EE302	DINESH KUMAR.M	8	8	7	9	8	40
7	EE303	GANESHBABU K	10	8	9	10	10	47
8	EE304	GOKULAKRISHNAN.B	8	7	8	7	7	37
9	EE305	IMMANVEL PETER	10	8	8	7	9	42
10	EE306	JOEL ROBINSON	10	10	10	10	10	50
11	EE308	KARTHI. P	10	8	9	10	10	47
12	EE309	KRISHNARAJ.S	8	7	8	7	7	37
13	EE310	MOHAN RAJ R	9	9	8	8	9	43
14	EE311	NAVEEN RAJ. R	10	10	10	10	10	50

Marks obtained

34 / 100

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MODEL EXAMINATION

NAME G. Samuel Mathews REGN. NO AEE.16019

PROGRAMME B.E (EEE) MARINE SEMESTER VII

COURSE & CODE Marine Electrical protection and Switch gears. DATE 19/11/19

No. of Page Written : Session: FN | AN ✓

Part A				Part B		Part C			
Q.No.	Marks	Q.No.	Marks	Q.No.	Marks	Q.No.	Marks	Q.No.	Marks
1	2	6		11		12.a		14.b	
2	2	7				12.b		15.a	
3	2	8				13.a		15.b	
4	2	9				13.b	12	16.a	
5	2	10				14.a	12	16.b	

Total Marks in Words Three Four

Name & Signature of the Examiner

SECTION-A

1) protective Zone :

The relay connected to the ratio current and it functions over Fluxing protection of a transformer.

2) Symmetrical Fault :

current analysis of the

Marks obtained

71 / 100

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MODEL EXAMINATION

NAME ANCNASH VIJAY REGN. NO AEE16002

PROGRAMME ~~BE~~ ELECTRICAL & ELECTRONICS (Mg) SEMESTER VII

COURSE & CODE MARINE ELECTRICAL PROTECTION & SWITCH GEARS DATE 19.11.2019

No. of Page Written : Session: FN ~~AN~~

Part A				Part B		Part C			
Q.No.	Marks	Q.No.	Marks	Q.No.	Marks	Q.No.	Marks	Q.No.	Marks
1	2	6		11	6	12.a		14.b	
2	2	7				12.b	13	15.a	8
3	2	8	2			13.a		15.b	
4	2	9	2			13.b	4	16.a	13
5	2	10				14.a	13	16.b	

Total Marks in Words Seven one

Name & Signature of the Examiner D. LOKHAMI

SECTION - B

9) On a Current Chopping the Current that is Cacoming is chopped to attain the level of protection.

Marks obtained

82 / 100

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MODEL EXAMINATION

NAME ..... K. GANESHBABU ..... REGN. NO ..... AEE16007 .....

PROGRAMME ..... BE(EEE) MARINE ..... SEMESTER ..... VII .....

COURSE & CODE ..... Marine Electrical protection and Switchgear & UBEE704 ..... DATE ..... 19.11.19 .....

No. of Page Written :

Session: FN | AN

Part A				Part B		Part C			
Q.No.	Marks	Q.No.	Marks	Q.No.	Marks	Q.No.	Marks	Q.No.	Marks
1	2	6	2	11	5	12.a	13	14.b	
2	2	7	2			12.b		15.a	
3	2	8	2			13.a		15.b	5
4	2	9	2			13.b	13	16.a	
5	2	10	2			14.a	13	16.b	13

Total Marks in Words ..... Eight Two .....

Name & Signature of the Examiner D.G D. GANESHBABU

Section - A

1. Protective Zone:

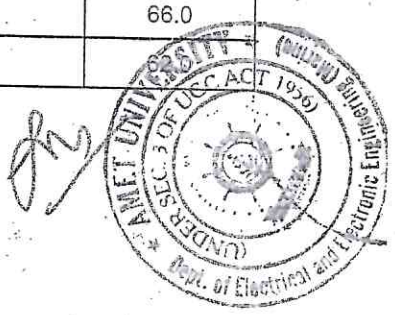
The protective zone is defined as the product of the power system and it is used to protect the protective scheme. is known as protective zone.

Continuous Internal Assessment Mark View

Course	B.E. - Electrical and Electronics Engineering-Marine	**Batch**	BE(EEEM)-9
Semester	7	**Group**	1
Subject	UBEE704 - Marine Electrical Protection and Switch Gears	**Assessment Type**	Model

S.No	Roll No	Reg No	Student Name	Marks
1	REE290	AEE15028	VIGNESH M	0.0
2	EE297	AEE16001	ABIRAJ.B	61.0
3	EE298	AEE16002	AVINASH VIJAY	71.0
4	EE299	AEE16003	AZARUTHEEN S	55.0
5	EE300	AEE16004	BEER MOHAMED UVAIZ. N	91.0
6	EE301	AEE16005	DHARUN.S	78.0
7	EE302	AEE16006	DINESH KUMAR.M	82.0
8	EE303	AEE16007	GANESHBABU K	82.0
9	EE304	AEE16008	GOKULAKRISHNAN.B	4.0
10	EE305	AEE16009	IMMANVEL PETER	70.0
11	EE306	AEE16010	JOEL ROBINSON	56.0
12	EE308	AEE16012	KARTHI. P	50.0
13	EE309	AEE16013	KRISHNARAJ.S	50.0
14	EE310	AEE16014	MOHAN RAJ R	56.0
15	EE311	AEE16015	NAVEEN RAJ. R	67.0
16	EE312	AEE16016	PUNNOOSE BENNY	56.0
17	EE314	AEE16018	ROHIT KUMAR	0.0
18	EE315	AEE16019	SAMUEL MATHEW.G	34.0
19	EE316	AEE16020	SNAHASISH SAHA	92.0
20	EE318	AEE16022	SURIYA R	62.0
21	EE319	AEE16023	VENKATESH S	84.0
22	EE320	AEE16024	VIGNESH.B	50.0
23	EE322	AEE16025	IVAN CELIO ALVES MAYER	0.0
24	EE323	AEE16026	SREERAG SREEKUMAR	64.0
25	EE324	AEE16027	PRAVEEN.D	72.0
26	EE325L	AEE16028L	AKASH S	76.0
27	EE326L	AEE16029L	ANITOSH MONDAL	64.0
28	EE327L	AEE16030L	SANTHOSH KUMAR D	54.0
29	EE328L	AEE16031L	VAITHIYANATHAN M S	74.0
30	EE321L	AEE16032L	SRI RAM SURATH KUMAR. V	66.0
31	EE376L	AEE16033L	SURYA .A	

Dhaliwal



Continuous Internal Assessment - Analysis and Corrective Actions

Course	B.E. – EEEM	**Batch**	B.E(EEEM)-9
Semester	7	**Group**	1
Subject	UEE704- Marine Electrical Protection and Switch Gears	**Test**	MODEL

Total No. of Students	31
No. of Students Appeared	28
No. of Students Absent	3
No. of Students Passed	28
No. of Weak Students	2

Distributed Marks

Range	0 - 9	10 - 19	20 - 29	30 - 39	40 - 49	50 - 59	60 - 69	70 - 79	80 - 89	90 - 99	100
No. of Students	4	0	0	1	0	8	7	6	3	2	0

Weak Students List [Secured Marks less than 50.0]

S.No	Roll No	Reg No	Name
1	EE304	AEE16008	Gokulakrishnan
2	EE315	AEE16019	Samuel Mathew

Root Cause Analysis:

Irregular to class

Corrective Action Taken:

Assignment given

Faculty Signature

HOD's Signature

Dr. T. SASILATHA, M.E., Ph.D.
Dean - EEE
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135, East Coast Road,
Kanathur - 603112, Chennai, India.

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END SEMESTER EXAMINATIONS (REGULAR) – DECEMBER 2019

Programme & Batch: B.E(EEEM)-9 **Semester** : VII
Course Title : Marine Electrical Protection and Switchgear **Course Code** : UBEE704
Duration : 3 Hours **Maximum** : 100 marks

Instructions:

1. Before attempting any question paper, be sure that you got the correct question paper.
2. The missing data, if any, may be assumed suitably
3. Use the sketches wherever necessary

CO1: Ability to find the causes of abnormal operating conditions of the apparatus and system.
CO2: Ability to suggest suitability circuit breaker.
CO3: Ability to understand and analyze Electromagnetic and Static Relays.
CO4: Ability to acquire knowledge on functioning of circuit breaker.
CO5: Ability to study about the apparatus protection, static and numerical relays.
CO6: Ability to analyze the characteristics and functions of relays and protection schemes.

Question No	Question	Mark	K Level (K1-K6)	(CO)
	Section A (10 * 2 = 20 Marks) Answer all Questions			
1	What is the difference between primary and backup protection?	2	K1	CO1
2	What is meant by dead spot in zones of protection?	2	K2	CO1
3	Write the torque equation of the universal relay.	2	K2	CO2
4	A relay is connected to 400/5 ratio current transformer with current setting of 150%. Calculate the Plug Setting Multiplier when circuit carries a fault current of 4000 A.	2	K2	CO2
5	Why busbar protection is needed?	2	K2	CO3
6	Which type of protection scheme is preferred for EHV and UHV power lines?	2	K2	CO3
7	What is static relay?	2	K1	CO4
8	State the slepian theory for arc interruption.	2	K2	CO4
9	Define symmetrical breaking capacity.	2	K1	CO5
10	What are the different methods of arc extinction.	2	K2	CO5

Section B (1 * 10 = 10 Marks) Compulsory Question

11	Discuss in detail about AC and DC Circuit Breaking.	10	K2	CO6

Section C (5 * 14 = 70 Marks) Answer All Questions

12(a)	(i)Explain clearly about the zones of protection in power system.	7	K2	CO1
	(ii) Explain types and effects of faults.	7		
	(OR)			
12(b)	Explain how fault current is calculated using symmetrical components method.	14	K2	CO1
13(a)	With neat sketch, Explain in detail about Directional and Non-Directional Induction Over current Relay.	14	K2	CO2
	(OR)			
13(b)	With the necessary sketch, Discuss in detail about electromagnetic Induction type relays.	14	K2	CO2
14(a)	(i) With a neat sketch explain the protection schemes for motors	7	K2	CO3
	(ii) Explain the operation of bus bar protection.	7		
	(OR)			
14(b)	Explain the protection of transformer against magnetising Inrush current with necessary diagrams.	14	K2	CO3
15(a)	Draw and explain the block diagram of static relay.	14	K2	CO4
	(OR)			
15(b)	With a neat sketch explain in detail about the synthesis of mho relay using phase comparator.	14	K2	CO4
16(a)	Write short notes on (i) Current Chopping (ii) Interruption of Capacitive current (iii) resistance Switching.	14	K2	CO5
	(OR)			

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End Semester Examinations - December 2019
Internal Exam Marks

Course	B.E. - Electrical and Electronics Engineering-Marine	Batch	BE(EEEM)-9
Semester	7	Group	1
Subject Code	UBEE704	Subject Name	Marine Electrical Protection and Switch Gears

S.No	Roll No	Reg. No	Student Name	CAT 1 [10]	CAT 2 [10]	Mode Exam 3 [10]	Assignment [5]	Attendance [5]	Internal [Max.40]	Student's Signature
1	REE290	AEE15028	VIGNESH M	0.0	0.0	0.0	0.0	0.0	0.0	
2	EE297	AEE16001	ABIRAJ.B	8.4	6.4	6.1	5.0	3.0	29.0	
3	EE298	AEE16002	AVINASH VIJAY	8.0	7.8	7.1	4.5	1.0	29.0	
4	EE299	AEE16003	AZARUTHEEN S	5.2	7.2	5.5	4.5	2.0	25.0	
5	EE300	AEE16004	BEER MOHAMED UVAIZ. N	8.8	8.8	9.1	5.0	1.0	33.0	
6	EE301	AEE16005	DHARUN.S	7.4	7.6	7.8	5.0	2.0	30.0	
7	EE302	AEE16006	DINESH KUMAR.M	6.0	8.6	8.2	5.0	5.0	33.0	
8	EE303	AEE16007	GANESHBABU K	5.4	8.4	8.2	5.0	4.0	31.0	
9	EE304	AEE16008	GOKULAKRISHNAN.B	0.0	7.8	0.4	3.5	0.0	12.0	
10	EE305	AEE16009	IMMANVEL PETER	6.8	6.0	7.0	5.0	4.0	29.0	
11	EE306	AEE16010	JOEL ROBINSON	7.4	7.2	5.6	4.5	3.0	28.0	
12	EE308	AEE16012	KARTHI. P	5.0	6.8	5.0	5.0	3.0	25.0	
13	EE309	AEE16013	KRISHNARAJ.S	5.2	6.8	5.0	4.75	1.0	23.0	
14	EE310	AEE16014	MOHAN RAJ R	6.8	6.8	5.6	4.9	1.0	26.0	
15	EE311	AEE16015	NAVEEN RAJ. R	6.2	8.4	6.7	4.75	5.0	32.0	
16	EE312	AEE16016	PUNNOOSE BENNY	7.4	7.4	5.6	4.75	1.0	27.0	
17	EE314	AEE16018	ROHIT KUMAR	0.0	0.0	0.0	0.0	0.0	0.0	

S.No	Roll No	Reg. No	Student Name	CAT 1 [10]	CAT 2 [10]	Mode Exam 3 [10]	Assignment [5]	Attendance [5]	Internal [Max.40]	Student's Signature
18	EE315	AEE16019	SAMUEL MATHEW.G	5.0	6.6	3.4	4.3	1.0	21.0	
19	EE316	AEE16020	SNAHASISH SAHA	9.2	6.2	9.2	4.7	4.0	34.0	
20	EE318	AEE16022	SURIYA R	5.6	8.6	6.2	4.8	4.0	30.0	
21	EE319	AEE16023	VENKATESH S	9.0	9.4	8.4	4.3	4.0	36.0	
22	EE320	AEE16024	VIGNESH.B	5.0	5.0	5.0	4.6	1.0	21.0	
23	EE322	AEE16025	IVAN CELIO ALVES MAYER	0.0	0.0	0.0	0.0	0.0	0.0	
24	EE323	AEE16026	SREERAG SREEKUMAR	5.0	5.8	6.4	4.9	2.0	25.0	
25	EE324	AEE16027	PRAVEEN.D	5.6	5.2	7.2	4.25	1.0	24.0	
26	EE325L	AEE16028L	AKASH S	8.8	6.8	7.6	4.85	4.0	33.0	
27	EE326L	AEE16029L	ANITOSH MONDAL	8.6	6.2	6.4	4.35	1.0	27.0	
28	EE327L	AEE16030L	SANTHOSH KUMAR D	5.2	6.6	5.4	4.85	2.0	25.0	
29	EE328L	AEE16031L	VAITHIYANATHAN M S	7.4	7.6	7.4	4.9	4.0	32.0	
30	EE321L	AEE16032L	SRI RAM SURATH KUMAR. V	6.2	5.4	6.6	4.9	1.0	25.0	
31	EE376L	AEE16033L	SURYA .A	6.0	5.2	6.2	4.6	1.0	23.0	

Name of the Faculty : D. Lakshmi

Signature of the Faculty :

Signature of the HOD with Seal

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Department of Electrical and Electronics Engineering

RUBRICS FOR SEMINAR

Attributes	Excellent (10)	Good (8-9)	Satisfactory (5-7)	Needs Improvement (<5)
How strong are the oral components of the seminar presentation?	fluent and poised; uses language comfortably and appropriately; speaks at an effective rate and volume; few fillers	Some degree of nervousness apparent; minor problems with language usage; speaker may speak too slowlyor quickly, too loudly or softly; fillers are noticeable	seems uncomfortable; several problems with language usage; speaker speaking much too slowly orquickly, too loudly or softly; fillers are noticeable	unable to deliver presentation coherently
Quality of Technical Content	Able to witness the in-depth preparation from the peer reviewed journals and magazines with appropriate terminologies used	Able to witness the preparation from the journal and magazines	Not able to recognize any preparation from journals and magazines	Not able to witness any quality content in the presentation
Presentation meet its intended objective	Objective of the presentation is easily identified; content supports objective	Objective is not immediately clear; some additional content needed to support objective	Difficult to determine the Objective; additional content needed to support objective	Very difficult to determine the Objective
Presentation address the intended audience	Content, structure, and language of presentation geared to intended audience	Presentation is missing some content required by audience; some language used inappropriately (e.g., unfamiliar jargon, too much jargon)	Presentation is missing a substantial portion of content required by audience; uses some inappropriate or ineffective language	No organization apparent; content of presentation reflects interests of student but not of audience; inappropriateuse of language
Organization reflect the purpose of the presentation	Appropriate use of direct/indirect structure; presentation organized according to audience's needs; relationshipbetween ideas clear; strong introduction and conclusion	Structure either too direct or too indirect; organization is evident but may be undermined by weak transitions or occasional	Direct or indirect structure used inappropriately; organization is confusing or unclear; weak introduction orconclusion	No discernible organization; thoughts in random order without connections between them

		digressions;		
References used to support the argument concrete, relevant, credible, accurate, and enough	clearly supported by accurate evidence considered credible by the audience; enough details are there to support the main points of the topic	Many details support the seminar, but some are not fully elaborated or sufficiently specific; some evidence not relevant	Some references are provided, but data not fully explained, relevant to the argument, or credible; important pieces of reference documents have not been included;	Little or no data to support the main ideas of the argument; much of the data is inaccurate
Nonverbal components of the presentation	uses gestures comfortably in line with his/her own style; eye contact is appropriate for audience; use of space appropriate for the situation	gesturing too much or too little; eye contact may be slightly too much or too little; speaker may be moving around a little too much or not quite enough	gesturing too much or too little; using distracting gestures; not enough eye contact; inappropriate use of space	Nonverbal components of the presentation distract from ability of the audience to receive the message
How much Audible/Voice Modulation	Audible and good clarity in presentation with appropriate voice modulation	Audible and good clarity in presentation with less voice modulation	Audible and clarity in presentation with in-appropriate voice modulation	Less audible and need clarity in presentation with voice modulation
Visual aids reinforce the message and add to the Effectiveness of the presentation	Appropriate visual aids are used; visual aids serve as a complement to the presenter and the message to be delivered; designed effectively; speaker uses visual aid easily	Appropriate visual aids are used; a few weaknesses in design; a few difficulties with use	Choice of visual aid is not satisfactory; weaknesses with design; difficulties with use	Inappropriate choice of visual aid; design detracts from presenter's ability to deliver the message; inability of presenter to use visual aid
Handled the Q&A portion of the presentation competently	Answers questions knowledgeably, thoroughly, and concisely; process is handled smoothly	Some difficulty in answering questions concisely; some problems responding to some questions.	Presenter is thrown off balance by questions; has few difficulty responding to some questioners	Unable to answer questions; difficultyin responding to questioners

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

EVALUATION FORM FOR SEMINAR

Course Code & Name: UAEE704 / Marine Electrical Protection and Switch Gears

Program & Batch: B.E. EEE- Marine &9

Semester/ Year: VII / IV

Academic Year: 2019 – 2020

S.no	Roll No.	Name of the Student	How strong are the oral components of the seminar presentation?	Quality of Technical Content	Presentation meet its intended objective	Presentation address the intended audience	Organization reflect the purpose of the presentation	References used to support the argument concrete, relevant, credible, accurate, and enough	Nonverbal components of the presentation	How much Audible/Voice Modulation	Visual aids reinforce the message and add to the Effectiveness of the presentation	portion of the presentation competently	Total Marks
			10	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**100**
1	EE297	ABIRAJ.B	10	9	9	10	9	9	9	9	9	9	92
2	EE298	AVINASH VIJAY	10	9	8	9	8	9	8	8	9	8	86
3	EE299	AZARUTHEEN S	10	9	8	9	8	7	10	8	10	7	86
4	EE300	BEER MOHAMED UVAIZ. N	10	9	9	10	9	9	9	9	9	9	92
5	EE301	DHARUN.S	10	9	9	10	9	9	9	9	9	9	92
6	EE302	DINESH KUMAR.M	10	9	10	9	9	10	9	9	10	10	95
7	EE303	GANESHBABU K	10	9	10	9	9	10	9	9	10	10	95
8	EE304	GOKULAKRISHNAN.B	10	9	6	7	6	9	7	6	7	7	74
9	EE305	IMMANVEL PETER	10	10	9	9	9	9	7	8	7	7	85

10	EE306	JOEL ROBINSON	10	10	10	10	10	10	10	10	10	10	100
11	EE308	KARTHI. P	10	9	10	9	9	10	9	9	10	10	95
12	EE309	KRISHNARAJ.S	10	10	9	9	9	9	7	8	7	7	85
13	EE310	MOHAN RAJ R	10	10	9	9	9	9	7	8	7	7	85
14	EE311	NAVEEN RAJ. R	10	10	10	10	10	8	8	8	10	10	94
15	EE312	PUNNOOSE BENNY	10	9	10	9	9	10	9	9	10	10	95
16	EE315	SAMUEL MATHEW.G	10	9	6	7	6	9	7	6	7	7	74
17	EE316	SNAHASISH SAHA	10	9	10	9	9	10	9	9	10	10	95
18	EE318	SURIYA R	10	10	9	9	9	9	7	8	7	7	85
19	EE319	VENKATESH S	10	9	10	9	9	10	9	9	10	10	95
20	EE320	VIGNESH.B	10	10	9	9	9	9	7	8	7	7	85
21	EE323	SREERAG SREEKUMAR	10	10	9	9	9	9	7	8	7	7	85
22	EE324	PRAVEEN.D	10	9	10	9	9	10	9	9	10	10	95
23	EE325L	AKASH S	10	9	10	9	9	10	9	9	10	10	95
24	EE326L	ANITOSH MONDAL	10	9	10	9	9	10	9	9	10	10	95
25	EE327L	SANTHOSH KUMAR D	10	9	10	9	9	10	9	9	10	10	95
26	EE328L	VAITHIYANATHAN M S	10	9	10	9	9	10	9	9	10	10	95
27	EE321L	SRI RAM SURATH KUMAR. V	10	9	10	9	10	10	9	10	10	10	97
28	EE376L	SURYA .A	10	9	10	9	9	8	9	9	10	10	93

Faculty In-Charge

PAC

HoD/ Dean

Dr. T. SASILATHA, M.E., Ph.D.
Dean - EEE
ACADEMY OF MARITIME EDUCATION AND TRAINING
(Declared as Deemed to be University u/s 3 of UGC

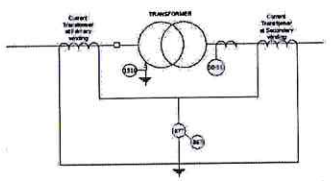
Faults occurring in Transformers

- Open-Circuit faults
- Earth faults
- Phase-to-Phase faults
- Inter-Turn faults
- Overheating

Factors in choosing Protective Gear for a Transformer

- Type of Transformer
- Size of the Transformer
- Type of Cooling
- System where used
- Importance of service for which it is required

Transformer Relaying Scheme



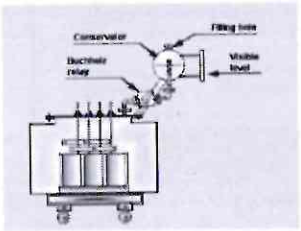
1. Buchholz Protection

Also known as gas accumulator relay, commonly used on all oil-immersed transformer provided with conservator.

Working Principle:

Whenever a fault occur inside the transformer, the oil of the tank gets overheated and gases are generated. The heat generated by the high local current causes the transformer oil to decompose and produce gas which can be used to detect the winding faults

Buchholz Protection



2. Core-Balance Leakage Protection

This system is used to provide protection against **earth faults** on high voltage winding.

When earth fault occurs, the sum of the three currents is no longer zero and a current is induced in the secondary of the CT causing the trip relay to operate and isolate the transformer from the bus-bars.

Introduction

The two major items of equipment in a power system are the generators and transformers. They have very high chance of fault occurrence and usually takes much time and money to repair the damage.

Fault and Abnormal Conditions

- **Generator :** Over Current, Over Voltage, Under Voltage, Under Frequency, Unbalanced Current, Loss of Excitation, Reverse Power, Winding Inter turn Fault, Winding Earth Fault etc.
- **Transformer :** Over Current, Winding Inter turn fault, Excessive Temperature Rise, Unbalance Current, Over fluxing etc.
- **Motors :** Over Current, Under Voltage, Unbalance Current, Winding Short Circuit, Stator Earth Fault, etc.
- **Transmission Line :** Single Phase to ground fault, Phase to Phase Fault, three phase to ground fault, Over Current etc.

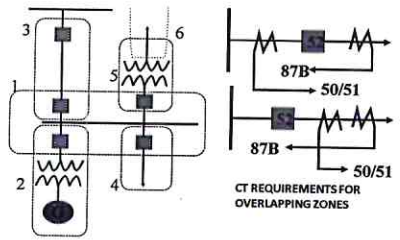
Zones of Protection

Regions (zones) of power system that can be protected adequately with fault recognition and removal resulting in isolation of a minimum amount of equipment.

Requirements: All power system elements must be encompassed by at least one zone

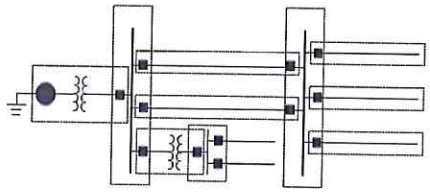
•Zones of protection must overlap to prevent any system element from being unprotected (no "blind spots").

Zones of Protection



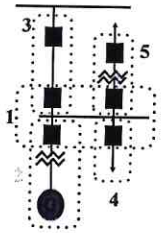
CT REQUIREMENTS FOR OVERLAPPING ZONES

Zones of Protection



Overlapping zones of protection

Zones of Protection



1 - Bus Protection
2 - Generator Protection
3 - Subtrans Line Protection
4 - Feeder Protection
5 - Transformer Protection

Motor Protection

Various Industry Motor Applications

- Fan, Blower
- Pump, Compressor
- Conveyor
- Mixer
- Cranes




Types of Fault in Motors

External Fault	Internal Fault
Mechanical Load	Bearing Failure
Unbalance Supply Voltage	Winding phase and earth fault
Single Phasing	
Phase Reversal	

Motor Protection Summary

- THERMAL OVERLOAD
- SHORT CIRCUIT
- EARTH FAULT
- UNBALANCE
- BLOCKED ROTOR/STALLING PROTECTION

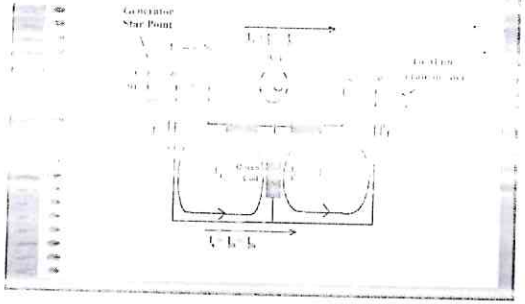
Thermal Stress Cause for Motor Failure

- Most of the motor failure contributors and failed motor components are related to motor overheating.
- Thermal stress pch motor can cause the failure of all the motor motor parts.

Thermal Overload

- Consider a motor is as homogenous body
- Developing

Differential



Negative Phase Sequence Protection:

induced in the rotor conductors and iron part. So both the eddy currents as well as the hysteresis losses increase due to these double frequencies induced currents in the rotor.

- Unbalanced loading affects (a) Rotor heating (b) Severe vibration & heating of stator.

FIELD FAILURE PROTECTION

- Acts as an Induction Generator
  - AVR Fails
  - Tripping of C.B
- damage the winding if this condition is sustained. Stator ha
  high stator currents due to increase in reactive current from
- By monitor (i) Field current, If
  (ii) Phase current & voltage.

REVERSE POWER PROTECTION:

- This protection is provided to protect against motoring.
- A generator is expected to supply active power to the connected system in normal operation. If the generator primover fails, a generator that is connected in parallel with another source of electrical supply will to begin to motor. This reversal of power flow due to loss of prime mover can be detected by reverse power element.

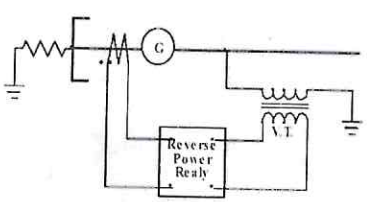
Possible Causes:

When immediately after Synchronising control valves are not operated which may happen due to some fault in the system or some delay by the operating personnel.

In case of sudden closure of stop valves or control valves when the generator unit is still connected to the grid.

Reverse power operation is harmful to the turbine since without steam flow in the turbine. If the turbine continues to rotate, it will result in heating of turbine blades due to churning action. However, the period for the turbine to overheat may vary from a few seconds to minutes depending upon the turbine & operating conditions.

Reverse Power



OVER FLUXING PROTECTI

- Fundamental Voltage- Flux relation:

V = 4.44 * N * f * ø V/f = 4.44 * N * ø

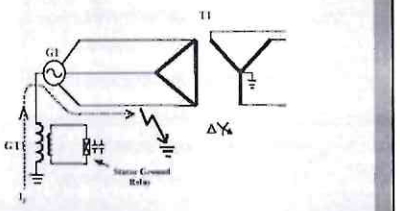
= K * ø = K * B/A

- V/f is a measure of flux in machine. That means, over fluxing the ratio of voltage to frequency exceeds certain limits. High v frequency, causing a rise in the V/f ratio, will produce high flu the magnetic core of the generator. This could cause the core o to saturate & stray flux to be induced in the unlamilated con have not designed to carry flux. The resulting eddy current components e.g. core bolts & clamps and end of core laminati rapid overheating and damage.

POSSIBLE CAUSES:

- AVR failure
- Load rejection under manual AVR control
- Excessive excitation with Generator Offline.
- Decreasing Speed with operator tries to maintain rated stator v
- AUTO to Manual transfer of AVR.

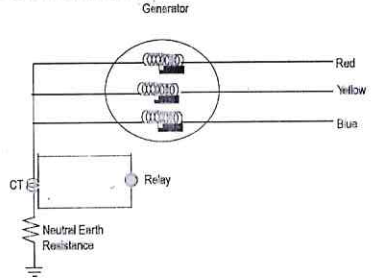
Ground Fault Protection



100% STATOR EARTH FAULT:

- In this protection, where neutral voltage measurement is made at generator terminals, (By Broken Delta); the third harmonic voltage element is used.
- First earth fault very near to neutral produces negligible current as driving voltage is nearly zero. But if a 2nd earth fault occurs at machine terminal, line to ground fault is not limited by NGR. The resulting fault current can be high. Hence, the 1st E/F very near to neutral has to be detected early and isolated.
- All generators produce continuous current of 3rd harmonic voltage. Under normal condition, 3rd harmonic voltage is present. If there is a fault near neutral, the amount of 3rd harmonic voltage comes down and this is used for detection.

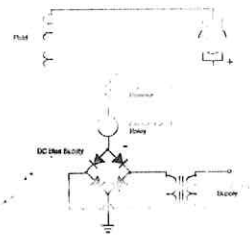
STATOR EARTH FAULT PROTECTION



ROTOR EARTH FAULT:

- **Since rotor circuits operate ungrounded, a single earth fault is caused by insulation failure due to moisture, [illegible] insulation or vibration, [illegible] The existence of single ground fault increases the chance of a second ground fault. The occurrence of second earth [illegible] is badly distorted. The rotor is displaced relative to the stator leading to severe vibrations and can damage the bearing.**
- **Although a machine can continuously run on a single earth fault but second rotor earth fault, if allowed to occur, should be detected immediately and generator should be tripped.**

Rotor Ground Fault



DIFFERENTIAL PROTECTION

- Differential protection is very reliable method for stator winding phase to phase fault. In this, currents on both sides of the generator are compared. Under normal condition or for a fault outside of the [illegible] relays.
- If a fault develops inside of the protected zone, current i1s and i2s are no longer equal, therefore i1s and i2s are not equal and therefore a current flows [illegible] relay.

Introduction

Generation ? Sources ?

Generator is the most precious/valuable equipment in PP which actually converts the

appear they can give warning alarms to trip the

- Generally *automatic tripping* are provided if the time for operator to take *corrective action is less* or the fault is likely to *cause serious damage* to the unit.

FAULT IN THE GENERATOR

- Stator
  - Phase to Phase fault.
  - Inter - turn fault
- Rotor
  - Two stage relay
    a) Alarm b) Trip
  - Over voltage in the rotor.

ABNORMAL OPERATING CONDITIONS:

Which affects the generator

- Negative Phase sequence
- Loss of Excitation
- Over fluxing protection
- Reverse power
- Over-speeding
- Pole slipping/ Out of Step

EARTH FAULT:

- When fault current flows through earth return path, the fault is called **Earth Fault.**
- Possible causes are

  (a) Insulation failure,

  (b) due to over **heating** (Failure of water/air circulation through stator conductor).
- Earth fault may occur between any phase conductor and core.
- It is usually practice to **limit the earth fault** current to avoid damage to the stator.

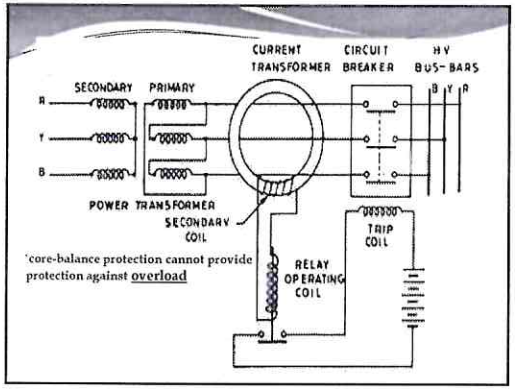
STAND BY EARTH FAULT:

- This protection is practically protects 95% of generator winding. Therefore a current setting of 5% of in to be set.
- E/F current is generally limited to about 15/20Amps.
- Earth fault current of even 100A for few seconds can cause external damage. So the earth fault is restricted to 100Amps. By providing NGR of 63.5 ohms at 11KV Voltage Level.
- This is a Back-Up protection.

2. Core-Balance Leakage Protection

This system is used to provide protection against **earth faults** on high voltage winding.

When earth fault occurs, the sum of the three currents is no longer zero and a current is induced in the secondary of the CT causing the trip relay to operate and isolate the transformer from the bus-bars.



3. Combined Leakage and Overload .Protection

The core-balance protection cannot provide protection against overload. It is usual practice to provide combined leakage and overload protection for transformer.

The **earth relay** has ***low current setting*** and operates **under earth faults** only.

The **overload relays** have ***high current setting*** it arranged to operate against **faults between the phases**

- In this system, two overload relay and one earth relay are connected. The two overload relays are sufficient to protect against phase to phase faults.
- The trip contacts of overload relays and earth fault relay are connected in parallel. Therefore the energizing of either one of them the circuit breaker will tripped.

Transformer Protection

❑ **Overheating**

- Overcurrent relaying for 501A and above

Characteristics:

- Must be below the damage curve
- Must be above magnetizing inrush

Conclusion

Open-circuit faults, earth faults, phase-to-phase faults, inter-turn faults and overheating are the fault that are likely occur in a transformer.

Protective relays are essential for keep equipment from being damaged

Transformer

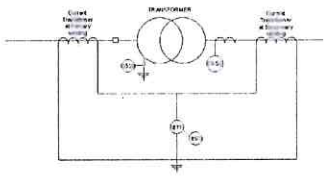
Faults occurring in Transformers

- Open-Circuit faults
- Earth faults

Factors in choosing Protective Gear for a Transformer

- Type of Transformer
- Size of the Transformer

Transformer Relaying Scheme



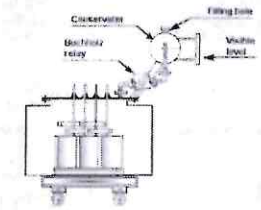
1. Buchholz Protection

Also known as gas accumulator relay, commonly used on all oil-immersed transformer provided with conservator.

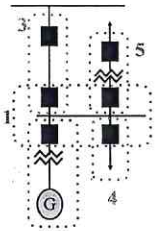
Working Principle:

Whenever a fault occur inside the transformer, the oil of the tank gets overheated and gases are generated. The heat generated by the high local current causes the transformer oil to decompose and produce gas which can be used to detect the winding faults

Buchholz Protection

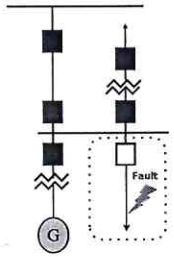


Zones of Protection

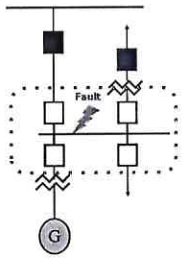


1 - Bus Protection
3 - Subtrans Line Protection
4 - Feeder Protection
5 - Transformer Protection

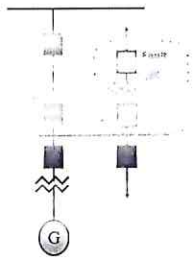
Feeder Protection



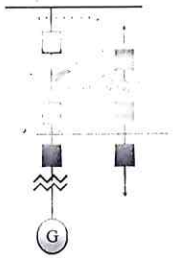
Bus Protection



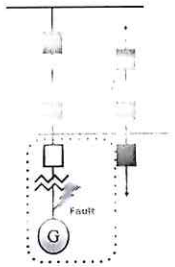
Transformer Protection



Sub transmission Line Protection



Generator Protection



UNIT

3

Protection

Introduction

The two major items of equipment in a power system are the generators and transformers. They have very high chance of fault occurrence

Fault and Abnormal

- **Generator :** Over Current, Over Voltage, Under Voltage, Under Frequency, Unbalanced Current, Loss of Excitation, Reverse Power, Winding Inter turn Fault, Winding Earth Fault etc.
- **Motors :** Over Current, Under Voltage, Unbalance Current, Winding
- **Transmission Line :** Single Phase to ground fault, Phase to Phase Fault, three phase to ground fault, Over Current etc.

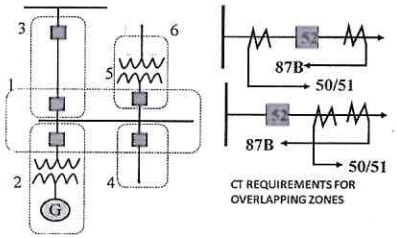
Zones of Protection

Regions (zones) of power system that can be protected adequately with fault recognition and removal resulting in isolation of a minimum amount of equipment.

Requirements: All power system elements must be encompassed by at least one zone

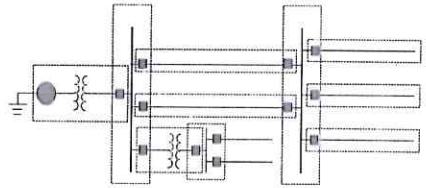
•Zones of protection must overlap to prevent any system element from being unprotected (no "blind spots").

Zones of Protection



CT REQUIREMENTS FOR OVERLAPPING ZONES

Zones of Protection



Overlapping zones of protection

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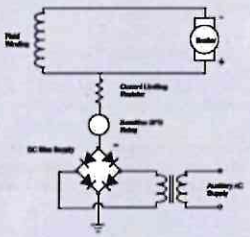
- **Since rotor** circuits operate ungrounded, a single earth fault is caused by insulation failure due to moisture, ageing of insulation or vibration of rotor etc. But existence of single ground fault increases the chance of a second ground fault. The occurrence of second earth fault can cause fault current flows. This results unsymmetrical flux distribution. The air gap flux is badly distorted. The rotor is displaced enough to rub stator leading to severe vibrations and can damage the bearing.
- **Although a machine can continuously run on a single earth fault but second rotor earth fault, if allowed to occur, should be detected immediately and generator should be tripped.**

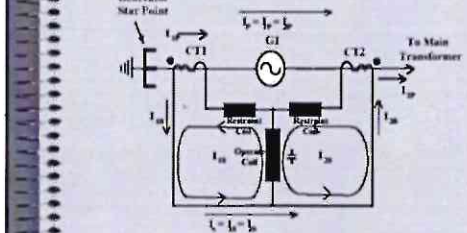
Rotor Ground Fault



DIFFERENTIAL PROTECTION

- Differential protection is very reliable method for stator winding phase to phase fault. In this, currents on both sides of the generator are compared.
- Under normal condition or for a fault outside of the protected zone, current i1s is equal to current i2s. Therefore, the currents in the CTs secondary's are also equal, i1s=i2s and no current flows through the current relays.
- If a fault develops inside of the protected zone, current i1s and i2s are no longer equal, therefore i1s and i2s are not equal and therefore a current flowing in the current relay.

Differential

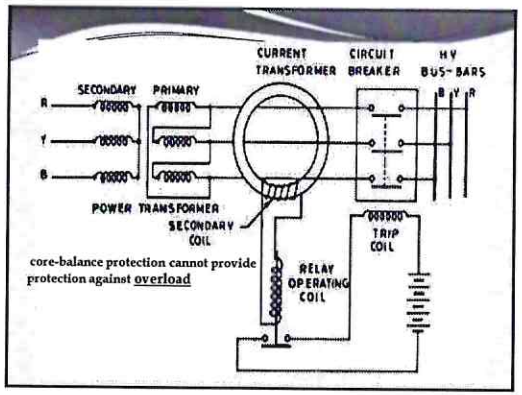


Negative Phase Sequence Protection:

- When the generator is connected to a balanced load, the phase currents are equal in magnitude and displaced electrically by 120°. The ATs wave produced by the stator currents rotate synchronously with the rotor and no eddy currents are induced in the rotor parts.
- If there is an unbalanced loading of the generator, and then the stator currents have a –ve sequence component. The stator field due to these –ve sequence currents rotates at synchronous speed but in a direction opposite to the direction of the field structure on the rotor. Thus, the –ve sequence stator armature mmf rotates at a speed –Ns, while the rotor field speed is +Ns. There is a relative velocity of 2Ns between the two.
- These causes double frequency currents, of large amplitude to be induced in the rotor conductors and iron part. So both the eddy currents as well as the hystersis losses increase due to these double frequencies induced currents in the rotor.
- Unbalanced loading affects ;(a) Rotor heating (b) Severe vibration & heating of stator.

FIELD FAILURE PROTECTION:

- Acts as an Induction Generator.
- Possible Causes;
  - AVR Fault
  - Tripping of Field C.B.
  - Open circuit or Short circuit occurring in the D.C. circuit.
  - PMG failure
- In normal condition, generator when running shares the reactive demand of the system. If excitation fails, synchronous generator draws reactive power from the power system instead of supplying the Qe. In case, the other generators can't meet the requirement of reactive power, this shall result in large voltage drop which may ultimately result in instability.
  - In this case, slip becomes –Ve result in slip frequency currents. Rotor gets heated up due to induced currents in the rotor winding, core or damage the winding if this condition is sustained. Stator heats up due to high stator currents due to increase in reactive current from the system.
- By monitor (i) Field current, If
  (ii) Phase current & voltage.



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The **overload relays** have *high current setting* it arranged to operate against **faults between the phases**

- In this system, two overload relay and one earth relay are connected. The two overload relays are sufficient to protect against phase to phase faults.
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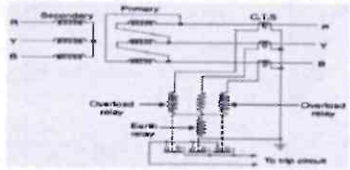

Transformer Protection

❑ **Overheating**

Normal maximum working temp. = 95 °C

8-10 °C rise will reduce the life of the transformer.

❑ **Overcurrent**

- Fuses for distribution transformer
- Overcurrent relaying for 5MVA and above

Characteristics:

- Must be below the damage curve
- Must be above magnetizing inrush

Generator Protection

- Generator ? Sources ?

Generator is the most precious/valuable equipment in PP which actually converts the mechanical energy of turbine into electricity.

Various relays are used to detect abnormalities and whenever fault conditions appear, they can give warning alarms to trip the unit automatically.

- Generally *automatic tripping* are provided if the time for operator to take *corrective action is less* or the fault is likely to *cause serious damage* to the unit.

FAULT IN THE GENERATOR

- Stator
  - Phase to Phase fault.
  - Inter - turn fault
  - Earth fault (80% & 100%)
- Rotor
  - Two stage relay:
    a) Alarm b) Trip
  - Over voltage in the rotor.

ABNORMAL OPERATING CONDITIONS:

Which affects the generator

- Negative Phase sequence
- Loss of Excitation
- Over fluxing protection
- Reverse power
- Over-speeding
- Pole slipping/ Out of Step

EARTH FAULT:

- When fault current flows through earth return path, the fault is called **Earth Fault.**
- Possible causes are

  (a) Insulation failure,

  (b) due to **over heating** (Failure of water/air circulation through stator conductor).
- Earth fault may occur between any phase conductor and core.
- It is usually practice to **limit the earth fault** current to avoid damage to the stator.

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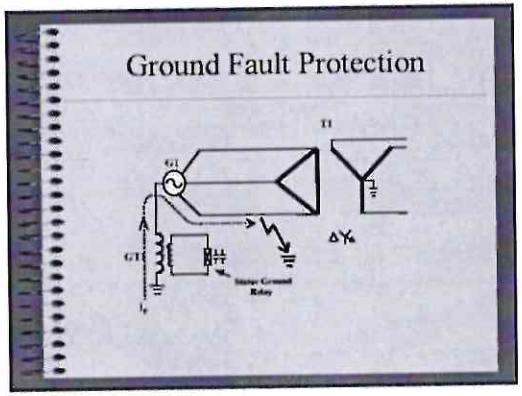
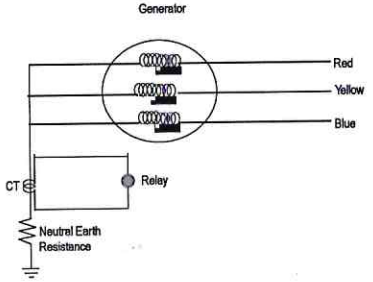
- This protection is practically protects 95% of **generator winding**. Therefore a current setting of 5% of in to be set.
- E/F current is generally limited to about 15/20Amps.
- Earth fault current of even 100A for few seconds can cause external damage. So the earth fault is restricted to 100Amps. By providing NGR of 63.5 ohms at 11KV Voltage Level.
- This is a Back-Up protection.



100% STATOR EARTH FAULT:

- In this protection, where neutral voltage measurement is made at generator terminals, (By Broken Delta), the third harmonic voltage element is used.
- First earth fault very near to neutral produces negligible current as driving voltage is nearly zero. But if a 2nd earth fault occurs at machine terminal, line to ground fault is not limited by NGR. The resulting fault current can be high. Hence, the 1st E/F very near to neutral has to be detected early and isolated.
- All generators produce continuous current of 3rd harmonic voltage. Under normal condition, 3rd harmonic voltage is present. If there is a fault near neutral, the amount of 3rd harmonic voltage comes down and this is used for detection.

STATOR EARTH FAULT PROTECTION



Academy of Maritime Education and Training Deemed to be UNIVERSITY

DEPARTMENT	EEE	PROGRAM NAME	B.E EEE-MARINE	SUBJECT HALDLING STAFF :	Dr D Lakshmi		
YEAR/SEM	IV / VII	BATCH	2016-2020				
SUBJECT CODE/NAME	UBEE704 - Marine Electrical Protection and Switch Gears	ACADEMIC YEAR	2019-2020	Target Level			
SUBJECT THRESHOLD	65.67%	CAY-1	CAY-2	CAY-3	Level 1	Level 2	Level 3
NO OF	28	68.00%	67.00%	62.00%	51%-55%	56%-60%	>60%

S.No	REG NO	NAME	CAT - I										Assignment-I			Direct attainment through CAT I	
		Question No.	PA1	PA2	PA3	PA4	PA5	PA6	PB7	PC8	PC9	TOTAL	C01	C02	TOTAL		
		BTL															
		Maximum Marks	2	2	2	2	2	2	10	14	14	50	10	10	(20M)	CO1	CO2
1	AEE16001	ABIRAJ.B	1	0	2	2	2	2	8	12	13	42	10	8	18	82.50%	90.00%
2	AEE16002	AVINASH VIJAY	1	0	2	2	2	2	8	12	11	40	8	8	16	77.50%	83.33%
3	AEE16003	AZARUTHEEN S	0	0	0	1	1	1	6	9	8	26	9	10	19	60.00%	70.00%
4	AEE16004	BEER MOHAMED UVAIZ. N	1	2	2	2	2	2	8	12	13	44	8	9	17	82.50%	93.33%
5	AEE16005	DHARUN.S	1	0	2	2	2	2	8	9	11	37	10	10	20	75.00%	90.00%
6	AEE16006	DINESH KUMAR.M	0	2	2	1	1	1	6	9	8	30	10	10	20	72.50%	70.00%
7	AEE16007	GANESHBABU K	0	2	0	0	1	1	6	9	8	27	10	9	19	67.50%	63.33%
8	AEE16008	GOKULAKRISHNAN.B	0	0	0	2	2	2	8	12	11	37	9	10	19	72.50%	90.00%
9	AEE16009	IMMANUEL PETER	0	0	0	2	2	2	8	9	11	34	8	10	18	62.50%	90.00%
10	AEE16010	JOEL ROBINSON	0	0	0	2	2	2	8	12	11	37	10	10	20	75.00%	90.00%
11	AEE16012	KARTHI. P	0	0	0	1	1	1	6	8	8	25	10	9	19	60.00%	66.67%
12	AEE16013	KRISHNARAJ.S	0	0	0	1	1	1	6	8	7	26	9	10	19	57.50%	66.67%
13	AEE16014	MOHAN RAJ R	0	0	0	2	2	2	8	9	10	33	8	9	17	62.50%	83.33%
14	AEE16015	NAVEEN RAJ. R	0	2	0	2	2	2	8	9	10	31	10	10	20	72.50%	86.67%
15	AEE16016	PUNNOOSE BENNY	0	0	0	2	2	2	8	12	11	37	8	9	17	70.00%	86.67%
16	AEE16019	SAMUEL MATHEW.G	0	0	0	1	1	1	6	8	8	25	9	8	17	57.50%	63.33%
17	AEE16020	SNAHASISH SAHA	1	2	2	2	2	2	9	13	13	46	10	10	20	92.50%	96.67%
18	AEE16022	SURIYA R	2	0	0	1	2	1	6	8	7	28	10	10	20	65.00%	70.00%
19	AEE16023	VENKATESH S	2	1	2	1	2	2	8	12	10	45	8	8	16	82.50%	76.67%
20	AEE16024	VIGNESH.B	0	0	0	1	1	1	6	8	8	25	8	9	17	55.00%	66.67%
21	AEE16026	SREERAG SREEKUMAR	0	0	0	1	1	1	6	8	8	25	9	9	18	57.50%	66.67%
22	AEE16027	PRAVEEN.D	0	1	2	1	1	1	6	8	8	28	8	8	16	62.50%	63.33%
23	AEE16028L	AKASH S	1	2	2	2	2	2	8	12	13	44	9	10	19	85.00%	96.67%
24	AEE16029L	ANITOSH MONDAL	1	2	2	2	2	2	8	12	12	43	8	9	17	82.50%	50.00%
25	AEE16030L	SANTHOSH KUMAR D	0	1	0	1	1	1	6	8	8	26	9	8	17	60.00%	63.33%
26	AEE16031L	VAITHIYANATHAN M S	1	0	2	2	2	2	8	9	11	37	9	8	17	72.50%	83.33%
27	AEE16032L	SRI RAM SURATH KUMAR. V	0	0	1	1	1	1	6	8	8	26	8	8	16	57.50%	63.33%
28	AEE16033L	SURYA .A	2	2	1	1	1	1	6	8	8	30	8	8	16	67.50%	63.33%

STUDENTS CROSSED SUBJECT THRESHOLD	16	21
TOTAL NO OF STUDENTS	28	28
PERCENTAGE OF ATTAINMENT	57%	75%
NO OF STUDENTS OBTAINED LEVEL 1	27	26
NO OF STUDENTS OBTAINED LEVEL 2	21	25
NO OF STUDENTS OBTAINED LEVEL 3	20	27
NO OF STUDENTS OBTAINED LEVEL 1	1	0
NO OF STUDENTS OBTAINED LEVEL 2	7	0
NO OF STUDENTS OBTAINED LEVEL 3	20	27

Academy of Maritime Education and Training Deemed to be UNIVERSITY

DEPARTMENT	EEE	PROGRAM NAME	B.E EEE-MARINE	SUBJECT HALDLING STAFF :	Dr.D.Lakshmi		
YEAR/SEM	IV / VII	BATCH	2016-2020				
SUBJECT CODE/NAME	UBEE704 - Marine Electrical Protection and Switch Gears	ACADEMIC YEAR	2019-2020	Target Level			
SUBJECT THRESHOLD	65.67%	CAY-1	CAY-2	CAY-3	Level 1	Level 2	Level 3
NO OF STUDENTS	28	68.00%	67.00%	62.00%	51%-55%	56%-60%	>60%

S.No	REG NO	NAME	CAT - II										Assignment-II			Direct attainment through CAT II	
		Question No.	PA1	PA2	PA3	PA4	PA5	PA6	PB7	PC8	PC9	TOTAL	C03	C04	TOTAL		
		BTL															
		Maximum Marks	2	2	2	2	2	2	10	14	14	50	10	10	(20M)	CO3	CO4
1	AEE16001	ABIRAJ.B	2	2	1	2	2	2	6	8	7	32	9	9	18	70.00%	73.33%
2	AEE16002	AVINASH VIJAY	2	2	1	2	2	2	6	8	12	39	9	9	18	70.00%	90.00%
3	AEE16003	AZARUTHEEN S	2	2	1	2	1	2	6	8	12	36	9	9	18	70.00%	86.67%
4	AEE16004	BEER MOHAMED UVAIZ. N	2	2	1	2	2	2	9	12	12	44	9	8	17	87.50%	86.67%
5	AEE16005	DHARUN.S	2	2	2	2	2	2	6	8	12	38	9	9	18	72.50%	90.00%
6	AEE16006	DINESH KUMAR.M	2	1	1	2	2	2	9	12	12	43	10	9	19	87.50%	90.00%
7	AEE16007	GANESHBABU K	1	1	1	2	2	2	9	12	12	42	10	9	19	85.00%	90.00%
8	AEE16008	GOKULAKRISHNAN.B	2	2	1	2	2	2	6	8	12	39	9	8	17	70.00%	86.67%
9	AEE16009	IMMANUEL PETER	2	2	1	2	2	0	6	8	7	30	9	9	18	70.00%	66.67%
10	AEE16010	JOEL ROBINSON	2	2	1	2	1	2	6	8	12	36	10	9	19	72.50%	86.67%
11	AEE16012	KARTHI. P	2	2	1	2	2	2	6	8	9	34	9	9	18	70.00%	80.00%
12	AEE16013	KRISHNARAJ.S	2	2	1	2	2	2	6	8	9	34	10	10	20	72.50%	83.33%
13	AEE16014	MOHAN RAJ R	2	2	1	2	2	2	6	8	9	34	9	9	18	70.00%	80.00%
14	AEE16015	NAVEEN RAJ. R	1	1	1	2	2	2	9	12	12	42	10	10	20	85.00%	93.33%
15	AEE16016	PUNNOOSE BENNY	2	2	2	2	1	2	6	8	12	37	9	8	17	72.50%	83.33%
16	AEE16019	SAMUEL MATHEW.G	2	2	2	2	2	2	6	8	7	33	9	9	18	72.50%	73.33%
17	AEE16020	SNAHASISH SAHA	1	2	1	2	2	2	6	8	7	31	9	9	18	67.50%	73.33%
18	AEE16022	SURIYA R	1	2	1	2	2	2	9	12	12	43	10	10	20	87.50%	93.33%
19	AEE16023	VENKATESH S	2	2	2	2	2	2	9	12	14	47	9	9	18	90.00%	96.67%
20	AEE16024	VIGNESH.B	0	0	1	0	0	2	6	8	8	25	9	9	18	60.00%	63.33%
21	AEE16026	SREERAG SREEKUMAR	0	0	1	2	2	2	6	8	8	29	10	9	19	62.50%	76.67%
22	AEE16027	PRAVEEN.D	0	0	1	1	0	2	6	8	8	26	8	8	16	57.50%	63.33%
23	AEE16028L	AKASH S	2	2	1	2	2	2	6	8	9	34	10	9	19	72.50%	80.00%
24	AEE16029L	ANITOSH MONDAL	1	2	1	2	2	2	6	8	7	31	9	8	17	67.50%	70.00%
25	AEE16030L	SANTHOSH KUMAR D	2	2	2	2	2	2	6	8	7	33	8	7	15	70.00%	66.67%
26	AEE16031L	VAITHIYANATHAN M S	2	2	2	2	2	2	6	8	12	38	9	8	17	72.50%	86.67%
27	AEE16032L	SRI RAM SURATH KUMAR. V	0	2	1	0	0	2	6	8	8	27	8	8	16	62.50%	60.00%
28	AEE16033L	SURYA .A	0	1	1	0	0	2	6	8	8	26	8	8	16	60.00%	60.00%

OF STUDENTS CROSSED SUBJECT THRESHOLD	23	24
TOTAL NO OF STUDENTS	28	28
PERCENTAGE OF ATTAINMENT	82%	86%
NO OF STUDENTS OBTAINED LEVEL 1	0	0
NO OF STUDENTS OBTAINED LEVEL 2	3	2
NO OF STUDENTS OBTAINED LEVEL 3	25	26

Academy of Maritime Education and Training Deemed to be UNIVERSITY

DEPARTMENT	EEE		PROGRAM NAME		B.E EEE-	SUBJECT HALDLING STAFF :	Dr.D Lakshmi		
YEAR/SEM	IV / VII		BATCH		2016-2020				
SUBJECT CODE/NAME	UBLE704 - Marine Electrical Protection and Switch Gears		ACADEMIC YEAR		2019-2020	Target Level			
SUBJECT THRESHOLD	65.67%		CAY-1	CAY-2	CAY-3	Level 1	Level 2	Level 3	
NO OF STUDENTS	28		68.00%	67.00%	62.00%	51%-55%	56%-60%	>60%	

S.No	REG NO	NAME	MODEL EXAM																
		Question No.	PA1	PA2	PA3	PA4	PA5	PA6	PA7	PA8	PA9	PA10	PB11	PC12	PC13	PC14	PC15	PC16	TOTAL
		BTL																	
		Maximum Marks	2	2	2	2	2	2	2	2	2	2	10	14	14	14	14	14	100
1	AEE16001	ABIRAJ.B	0	0	0	1	2	2	2	0	0	0		10	10	9	8	9	61
2	AEE16002	AVINASH VIJAY	2	2	2	2	2	2	2	2	0	0		10	10	10	8	9	71
3	AEE16003	AZARUTHEEN S	0	0	0	1	2	2	0	0	0	0		9	7	9	8	9	55
4	AEE16004	BEER MOHAMED UVAIZ. N	1	0	1	2	2	2	2	2	2	2		14	13	12	13	13	91
5	AEE16005	DHARUN.S	2	2	2	2	2	2	2	2	1	0		10	10	10	11	12	78
6	AEE16006	DINESH KUMAR.M	2	2	2	2	2	2	2	2	1	0		10	10	10	14	12	82
7	AEE16007	GANESHBABU K	2	2	2	2	2	2	2	2	1	0		10	10	10	14	12	82
8	AEE16008	GOKULAKRISHNAN.B	0	0	0	0	1	0	1	2	0	0		0	0	0	0	0	4
9	AEE16009	IMMANUEL PETER	2	2	2	2	2	2	2	2	0	0		10	10	10	8	8	70
10	AEE16010	JOEL ROBINSON	0	0	0	1	2	2	0	0	0	0		9	8	9	8	9	56
11	AEE16012	KARTHI. P	0	0	0	1	2	2	0	0	0	0		6	8	9	8	6	50
12	AEE16013	KRISHNARAJ.S	0	0	0	1	2	2	0	0	0	0		6	8	9	8	6	50
13	AEE16014	MOHAN RAJ R	0	0	0	1	2	2	0	0	0	0		9	8	9	8	9	56
14	AEE16015	NAVEEN RAJ. R	2	0	0	2	2	2	2	2	0	0		10	10	10	8	9	74
15	AEE16016	PUNNOOSE BENNY	0	0	0	1	2	2	0	0	0	0		9	8	9	8	9	56
16	AEE16019	SAMUEL MATHEW.G	0	0	0	1	1	0	0	2	0	2		0	8	9	4	7	34
17	AEE16020	SNAHASISH SAHA	1	0	2	2	2	2	2	2	2	2		14	13	12	13	13	92
18	AEE16022	SURIYA R	1	0	0	1	2	2	2	0	0	0		10	10	9	8	9	62
19	AEE16023	VENKATESH S	2	2	2	2	2	2	2	2	1	2		10	10	10	14	12	84
20	AEE16024	VIGNESH.B	0	0	0	1	2	2	0	0	0	0		6	8	9	8	6	50
21	AEE16026	SREERAG SREEKUMAR	1	0	0	1	2	2	2	0	0	0		10	10	11	8	9	64
22	AEE16027	PRAVEEN.D	2	2	2	2	2	2	2	2	0	0		10	10	10	8	10	62
23	AEE16028L	AKASH S	2	2	2	0	2	2	2	2	1	0		10	10	10	11	12	76
24	AEE16029L	ANITOSH MONDAL	1	0	0	1	2	2	2	0	0	0		10	10	11	8	9	64
25	AEE16030L	SANTHOSH KUMAR D	0	0	0	1	0	2	1	1	1	1		9	8	9	8	9	54
26	AEE16031L	VAITHIYANATHAN M S	2	2	2	2	2	2	2	2	0	2		10	10	10	8	10	74
27	AEE16032L	SRI RAM SURATH KUMAR. V	2	0	0	2	2	2	2	2	0	0		10	10	10	8	8	55
28	AEE16033L	SURYA .A	1	0	0	1	2	2	2	0	0	0		10	10	9	8	9	50

NO OF STUDENTS CROSSED SU	
TOT	
PERCENTA	
NO OF STUDENTS	
NO OF STUDENTS	
NO OF STUDENTS	

ACTIVE LEARNING METHOD			Direct attainment through Model Exam					
C05	C06	TOTAL						
10	10	(20M)	CO1	CO2	CO3	CO4	CO5	CO6
9	10	19	55.56%	61.11%	72.22%	55.56%	64.29%	90.00%
9	9	18	77.78%	77.78%	77.78%	66.67%	64.29%	83.33%
9	9	18	50.00%	44.44%	72.22%	44.44%	64.29%	70.00%
9	8	17	83.33%	88.89%	88.89%	94.44%	92.86%	90.00%
10	9	19	77.78%	77.78%	77.78%	83.33%	82.14%	83.33%
9	9	18	77.78%	77.78%	77.78%	100.00%	78.57%	83.33%
8	9	17	77.78%	77.78%	77.78%	100.00%	75.00%	83.33%
9	9	18	0.00%	0.00%	5.56%	16.67%	32.14%	33.33%
9	10	19	77.78%	77.78%	77.78%	66.67%	60.71%	86.67%
9	8	17	50.00%	50.00%	72.22%	44.44%	64.29%	70.00%
9	9	18	33.33%	50.00%	72.22%	44.44%	53.57%	73.33%
8	8	16	33.33%	50.00%	72.22%	44.44%	50.00%	70.00%
9	10	19	50.00%	50.00%	72.22%	44.44%	64.29%	76.67%
10	10	20	66.67%	66.67%	77.78%	66.67%	67.86%	86.67%
8	7	15	50.00%	50.00%	72.22%	44.44%	60.71%	66.67%
8	8	16	0.00%	50.00%	55.56%	33.33%	60.71%	60.00%
6	9	15	83.33%	94.44%	88.89%	94.44%	82.14%	93.33%
10	10	20	61.11%	61.11%	72.22%	55.56%	67.86%	83.33%
9	9	18	77.78%	77.78%	77.78%	100.00%	85.71%	83.33%
8	9	17	33.33%	50.00%	72.22%	44.44%	50.00%	73.33%
9	9	18	61.11%	61.11%	83.33%	55.56%	64.29%	80.00%
8	8	16	77.78%	77.78%	77.78%	66.67%	64.29%	80.00%
9	10	19	77.78%	66.67%	77.78%	83.33%	78.57%	80.00%
9	9	18	61.11%	61.11%	83.33%	55.56%	64.29%	80.00%
6	9	15	50.00%	50.00%	61.11%	55.56%	60.71%	66.67%
9	9	18	77.78%	77.78%	77.78%	66.67%	75.00%	83.33%
8	8	16	66.67%	66.67%	77.78%	66.67%	57.14%	80.00%
8	8	16	61.11%	61.11%	72.22%	55.56%	60.71%	76.67%
UBJECT THRESHOLD			13	13	25	13	10	26
AL NO OF STUDENTS			28	28	28	28	28	28
GE OF ATTAINMENT			46%	46%	89%	46%	36%	93%
S OBTAINED LEVEL 1			0	0	0	0	1	0
S OBTAINED LEVEL 2			1	0	1	6	1	1
S OBTAINED LEVEL 3			17	18	26	13	23	26

Academy of Maritime Education and Training Deemed to be UNIVERSITY

DEPARTMENT	EEE	PROGRAM NAME	B.E EEE-MARINE	SUBJECT HALDLING STAFF :	Dr.D.Lakshmi
YEAR/SEM	IV / VII	BATCH	2016-2020		
SUBJECT CODE/NAME	UBEE704 - Marine Electrical Protection and Switch Gears	ACADEMIC YEAR	2019-2020	Target Level	
SUBJECT THRESHOLD	65.67%	CAY-1	CAY-2	CAY-3	Level 1	Level 2	Level 3
NO OF STUDENTS	28	68.00%	67.00%	62.00%	51%-55%	56%-60%	>60%

S.No	REG NO	NAME	END SEMESTER EXAM										
		Question No.	PA1	PA2	PA3	PA4	PA5	PA6	PA7	PA8	PA9	PA10	PB11
		BTL											
		Maximum Marks	2	2	2	2	2	2	2	2	2	2	10
1	AEE16001	ABIRAJ.B	1	1	1	0	0	0	0	0	0	0	6
2	AEE16002	AVINASH VIJAY	1	2	1	1	1	0	0	0	0	0	6
3	AEE16003	AZARUTHEEN S	1	1	1	0	0	0	0	0	0	0	7
4	AEE16004	BEER MOHAMED UVAIZ. N	1	1	1	0	2	2	2	1	0	0	6
5	AEE16005	DHARUN.S	1	2	1	1	1	0	1	1	1	1	5
6	AEE16006	DINESH KUMAR.M	1	2	1	1	1	0	1	1	1	1	5
7	AEE16007	GANESHBABU K	1	2	1	1	1	1	2	0	0	0	7
8	AEE16008	GOKULAKRISHNAN.B	0	0	0	0	0	0	0	0	0	0	0
9	AEE16009	IMMANUEL PETER	1	1	1	0	2	2	1	0	0	0	6
10	AEE16010	JOEL ROBINSON	1	2	1	1	1	2	0	0	0	0	6
11	AEE16012	KARTHI. P	2	0	0	0	0	0	2	2	2	2	3
12	AEE16013	KRISHNARAJ.S	1	2	1	1	1	0	0	0	0	0	7
13	AEE16014	MOHAN RAJ R	2	0	0	0	0	0	2	2	2	2	3
14	AEE16015	NAVEEN RAJ. R	1	2	1	1	1	1	2	0	0	0	7
15	AEE16016	PUNNOOSE BENNY	1	1	1	0	0	0	0	0	0	0	4
16	AEE16019	SAMUEL MATHEW.G	0	0	0	0	0	0	0	0	0	0	0
17	AEE16020	SNAHASISH SAHA	1	1	2	2	2	2	2	1	0	0	6
18	AEE16022	SURIYA R	1	1	1	0	0	0	0	0	0	0	7
19	AEE16023	VENKATESH S	1	1	2	2	2	2	2	1	0	0	7
20	AEE16024	VIGNESH.B	2	0	0	0	0	0	2	2	2	2	3
21	AEE16026	SREERAG SREEKUMAR	1	1	1	0	0	0	0	0	0	0	7
22	AEE16027	PRAVEEN.D	1	1	1	0	2	2	1	0	0	0	4
23	AEE16028L	AKASH S	1	2	2	2	2	2	2	1	2	2	5
24	AEE16029L	ANITOSH MONDAL	1	1	2	2	2	2	2	1	1	1	4
25	AEE16030L	SANTHOSH KUMAR D	1	1	1	0	2	2	2	1	1	1	4
26	AEE16031L	VAITHIYANATHAN M S	1	1	1	0	2	2	1	1	1	1	4
27	AEE16032L	SRI RAM SURATH KUMAR. V	1	2	1	1	1	0	0	0	0	0	5
28	AEE16033L	SURYA .A	1	2	1	1	1	1	2	0	0	0	5

PC12	PC13	PC14	PC15	PC16	TOTAL	Direct attainment through End Semester Exam					
14	14	14	14	14	100	CO1	CO2	CO3	CO4	CO5	CO6
10	10	11	12	11	63	66.67%	61.11%	61.11%	66.67%	61.11%	60.00%
7	8	8	7	9	51	55.56%	55.56%	50.00%	38.89%	50.00%	60.00%
9	10	11	10	11	61	61.11%	61.11%	61.11%	55.56%	61.11%	70.00%
10	10	11	11	12	70	66.67%	61.11%	83.33%	77.78%	66.67%	60.00%
5	8	8	9	10	55	44.44%	55.56%	50.00%	61.11%	66.67%	50.00%
5	8	8	7	8	51	44.44%	55.56%	50.00%	50.00%	55.56%	50.00%
7	8	8	9	10	58	55.56%	55.56%	55.56%	61.11%	55.56%	70.00%
0	0	0	0	0	0	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
10	10	11	12	11	68	66.67%	61.11%	83.33%	72.22%	61.11%	60.00%
8	8	8	6	9	53	61.11%	55.56%	61.11%	33.33%	50.00%	60.00%
3	4	4	0	0	28	27.78%	22.22%	22.22%	22.22%	22.22%	30.00%
7	8	8	9	10	55	55.56%	55.56%	50.00%	50.00%	55.56%	70.00%
3	12	4	2	4	38	27.78%	66.67%	22.22%	33.33%	44.44%	30.00%
7	8	8	8	11	58	55.56%	55.56%	55.56%	55.56%	61.11%	70.00%
12	10	11	13	10	63	77.78%	61.11%	61.11%	72.22%	55.56%	40.00%
0	0	0	0	0	0	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
10	10	11	12	11	73	66.67%	77.78%	83.33%	83.33%	61.11%	60.00%
9	10	11	12	11	63	61.11%	61.11%	61.11%	66.67%	61.11%	70.00%
9	10	11	12	11	73	61.11%	77.78%	83.33%	83.33%	61.11%	70.00%
3	7	4	2	4	33	27.78%	38.89%	22.22%	33.33%	44.44%	30.00%
9	10	11	12	11	63	61.11%	61.11%	61.11%	66.67%	61.11%	70.00%
12	10	11	13	10	68	77.78%	61.11%	83.33%	77.78%	55.56%	40.00%
10	13	11	13	10	80	72.22%	94.44%	83.33%	88.89%	77.78%	50.00%
10	12	11	13	10	75	66.67%	88.89%	83.33%	88.89%	66.67%	40.00%
10	10	11	13	10	70	66.67%	61.11%	83.33%	88.89%	66.67%	40.00%
9	10	11	13	10	68	61.11%	61.11%	83.33%	83.33%	66.67%	40.00%
8	8	8	7	8	50	61.11%	55.56%	50.00%	38.89%	44.44%	50.00%
9	8	8	9	8	56	66.67%	55.56%	55.56%	61.11%	44.44%	50.00%
NO OF STUDENTS CROSSED SUBJECT THRESHOLD						10	5	9	13	6	7
TOTAL NO OF STUDENTS						28	28	28	28	28	28
PERCENTAGE OF ATTAINMENT						36%	18%	32%	46%	21%	25%
NO OF STUDENTS OBTAINED LEVEL 1						0	0	0	0	0	0
NO OF STUDENTS OBTAINED LEVEL 2						4	9	3	2	5	6
NO OF STUDENTS OBTAINED LEVEL 3						17	15	15	16	14	7

Academy of Maritime Education and Training Deemed to be UNIVERSITY
Department of EEE

Program Name:	B.E EEE-M	Total Students:	28
Sub. Code & Name :	UBEE704 - Marine Electrical Protection and Switch Gears	Academic Year	2019-20
Year & Sem	IV / VII	Batch:	2016-20

INDIRECT ASSESSMENT OF COURSE OUTCOMES

CO No.	CO Statement	BTL
CO1	Illustrate various protection schemes in marine electrical systems	K2
CO2	Compare different protective relays	K5
CO3	Distinguish different protection schemes for apparatus such as generator, motor and transformer	K4
CO4	Analyze different phenomena of circuit interruptions	K4
CO5	Compare different types of circuit Breakers	K5
CO6	Apply the concept of protection methods and equipments in marine electrical systems	K3

(1) Low Correlation (2) Medium Correlation (3) High Correlation

S.No	Register Number	Name of the Student	CO1 Q.1	CO1 Q.2	CO1 AVG	CO2 Q.3	CO2 Q.4	CO2 AVG	CO3 Q.5	CO3 Q.6	CO3 AVG	CO4 Q.7	CO4 Q.8	CO4 AVG	CO5 Q.9
1	AEE16001	ABIRAJ.B	3	2	2.5	3	3	3	3	3	3	3	3	3	3
2	AEE16002	AVINASH VIJAY	3	3	3	3	3	3	2	2	2	2	3	2.5	2
3	AEE16003	AZARUTHEEN S	3	3	3	3	1	3	3	2	2	3	3	3	2
4	AEE16004	BEER MOHAMED UVAIZ. N	3	3	3	3	3	3	2	2	2	3	3	3	2
5	AEE16005	DHARUN.S	2	3	2.5	3	3	3	2	3	2.5	3	3	3	2
6	AEE16006	DINESH KUMAR.M	3	3	3	3	3	3	2	3	2.5	3	3	3	3
7	AEE16007	GANESHBABU K	3	3	3	2	2	2	3	2	2.5	3	2	2.5	3
8	AEE16008	GOKULAKRISHNAN.B	3	3	3	2	2	2	3	3	3	2	2	2	3
9	AEE16009	IMMANUEL PETER	3	3	3	3	1	2	3	3	3	3	1	2	2
10	AEE16010	JOEL ROBINSON	2	2	2	3	3	3	3	3	3	2	2	2	3
11	AEE16012	KARTHI. P	3	3	3	3	2	2.5	3	2	2.5	2	3	2.5	3
12	AEE16013	KRISHNARAJ.S	2	3	2.5	2	2	2	3	3	3	2	3	2.5	3
13	AEE16014	MOHAN RAJ R	2	3	2.5	3	1	2	3	3	3	3	3	3	3
14	AEE16015	NAVEEN RAJ. R	3	3	3	3	3	3	1	2	1.5	1	3	2	3
15	AEE16016	PUNNOOSE BENNY	2	2	2	3	2	2.5	2	3	2.5	3	2	2.5	3
16	AEE16019	SAMUEL MATHEW.G	2	2	2	3	3	3	2	2	2	1	2	1.5	2
17	AEE16020	SNAHASISH SAHA	3	2	2.5	3	2	2.5	2	1	1.5	2	3	2.5	3
18	AEE16022	SURIYA R	3	1	2	3	3	3	2	2	2	3	3	3	2
19	AEE16023	VENKATESH S	3	1	2	3	1	2	3	2	2.5	3	2	2.5	3
20	AEE16024	VIGNESH.B	3	2	2.5	1	2	1.5	3	2	2.5	3	2	2.5	2
21	AEE16026	SREERAG SREEKUMAR	2	2	2	1	2	1.5	3	3	3	3	2	2.5	3
22	AEE16027	PRAVEEN.D	2	3	2.5	1	3	2	3	3	3	3	2	2.5	3
23	AEE16028L	AKASH S	1	3	2	2	3	2.5	3	3	3	3	2	2.5	3
24	AEE16029L	ANITOSH MONDAL	1	3	2	3	3	3	2	2	2	2	3	2.5	3
25	AEE16030L	SANTHOSH KUMAR D	3	2	2.5	3	2	2.5	1	2	1.5	2	3	2.5	3
26	AEE16031L	VAITHIYANATHAN M S	3	2	2.5	2	3	2.5	3	2	2.5	3	3	3	3
27	AEE16032L	SRI RAM SURATH KUMAR. V	3	1	2	1	3	2	3	3	3	2	2	2	2
28	AEE16033L	SURYA .A	3	2	2.5	1	3	2	3	3	3	3	2	2.5	2

Indirect Course Outcomes	CO1	CO1	CO2	CO2	CO3	CO3	CO4	CO4	CO5	CO5	CO6	CO6
Number of Students Answered - 1 (Low)	2	3	5	4	2	1	2	1	0	2	1	4
Number of Students Answered - 2 (Medium)	8	10	5	9	9	13	9	12	10	12	7	11
Number of Students Answered - 3 (High)	18	15	18	15	17	14	17	15	18	14	20	13
Total Number of Students Participated	28	28	28	28	28	28	28	28	28	28	28	28
Total Number of Students Answered 2 & 3	26	25	23	24	26	27	26	27	28	26	27	24
	0.93	0.89	0.82	0.86	0.93	0.96	0.93	0.96	1.00	0.93	0.96	0.86
Indirect CO Attainment Percentage	91%		84%		95%		95%		96%		91%	

CO5 Q.10	CO5 AVG	CO6 Q.11	CO6 Q.12	CO6 AVG	CO 1	CO2	CO3	CO4	CO5	CO6
2	2.5	3	2	2.5	83.33%	100.00%	100.00%	100.00%	83.33%	83.33%
3	2.5	3	3	3	100.00%	100.00%	66.67%	83.33%	83.33%	100.00%
3	2.5	3	3	3	100.00%	100.00%	66.67%	100.00%	83.33%	100.00%
3	2.5	3	3	3	100.00%	100.00%	66.67%	100.00%	83.33%	100.00%
2	2	2	3	2.5	83.33%	100.00%	83.33%	100.00%	66.67%	83.33%
2	2.5	2	3	2.5	100.00%	100.00%	83.33%	100.00%	83.33%	83.33%
2	2.5	3	3	3	100.00%	66.67%	83.33%	83.33%	83.33%	100.00%
3	3	3	2	2.5	100.00%	66.67%	100.00%	66.67%	100.00%	83.33%
2	2	3	2	2.5	100.00%	66.67%	100.00%	66.67%	66.67%	83.33%
3	3	3	2	2.5	66.67%	100.00%	100.00%	66.67%	100.00%	83.33%
2	2.5	3	1	2	100.00%	83.33%	83.33%	83.33%	83.33%	66.67%
3	3	3	1	2	83.33%	66.67%	100.00%	83.33%	100.00%	66.67%
3	3	3	2	2.5	83.33%	66.67%	100.00%	100.00%	100.00%	83.33%
3	3	3	3	3	100.00%	100.00%	50.00%	66.67%	100.00%	100.00%
3	3	3	3	3	66.67%	83.33%	83.33%	83.33%	100.00%	100.00%
3	2.5	1	3	2	66.67%	100.00%	66.67%	50.00%	83.33%	66.67%
2	2.5	2	2	2	83.33%	83.33%	50.00%	83.33%	83.33%	66.67%
2	2	3	2	2.5	66.67%	100.00%	66.67%	100.00%	66.67%	83.33%
2	2.5	2	1	1.5	66.67%	66.67%	83.33%	83.33%	83.33%	50.00%
1	1.5	3	1	2	83.33%	50.00%	83.33%	83.33%	50.00%	66.67%
1	2	2	3	2.5	66.67%	50.00%	100.00%	83.33%	66.67%	83.33%
3	3	3	3	3	83.33%	66.67%	100.00%	83.33%	100.00%	100.00%
3	3	2	2	2	66.67%	83.33%	100.00%	83.33%	100.00%	66.67%
3	3	2	2	2	66.67%	100.00%	66.67%	83.33%	100.00%	66.67%
3	3	3	2	2.5	83.33%	83.33%	50.00%	83.33%	100.00%	83.33%
2	2.5	3	3	3	83.33%	83.33%	83.33%	100.00%	83.33%	100.00%
2	2	3	2	2.5	66.67%	66.67%	100.00%	66.67%	66.67%	83.33%
2	2	3	3	3	83.33%	66.67%	100.00%	83.33%	66.67%	100.00%

Academy of Maritime Education and Training Deemed to be UNIVERSITY

DEPARTMENT	EEE		PROGRAM NAME		B.E EEE-MARINE		SUBJECT HALDLING STAFF :		Dr.D.Lakshmi
YEAR/SEM	IV / VII		BATCH		2016-2020				
SUBJECT CODE/NAME	UBEE704 - Marine Electrical Protection and Switch Gears		ACADEMIC YEAR		2019-2020		Target Level		
SUBJECT THRESHOLD	65.67%		CAY-1	CAY-2	CAY-3		Level 1	Level 2	Level 3
NO OF STUDENTS	28		68.00%	67.00%	62.00%		51%-55%	56%-60%	>60%

S.No	REG NO	NAME	CAT - I													
		Question No.	PA1	PA2	PA3	PA4	PA5	PA6	PB7	PC8	PC9	TOTAL	PA1	PA2	PA3	PA4
		BTL	0	0	0	0	0	0	0	0	0		0	0	0	0
		Maximum Marks	2	2	2	2	2	2	10	14	14	50	2	2	2	2
1	AEE16001	ABIRAJ.B	1	0	2	2	2	2	8	12	13	42	2	2	1	2
2	AEE16002	AVINASH VIJAY	1	0	2	2	2	2	8	12	11	40	2	2	1	2
3	AEE16003	AZARUTHEEN S	0	0	0	1	1	1	6	9	8	26	2	2	1	2
4	AEE16004	BEER MOHAMED UVAIZ. N	1	2	2	2	2	2	8	12	13	44	2	2	1	2
5	AEE16005	DHARUN.S	1	0	2	2	2	2	8	9	11	37	2	2	2	2
6	AEE16006	DINESH KUMAR.M	0	2	2	1	1	1	6	9	8	30	2	1	1	2
7	AEE16007	GANESHBABU K	0	2	0	0	1	1	6	9	8	27	1	1	1	2
8	AEE16008	GOKULAKRISHNAN.B	0	0	0	2	2	2	8	12	11	37	2	2	1	2
9	AEE16009	IMMANUEL PETER	0	0	0	2	2	2	8	9	11	34	2	2	1	2
10	AEE16010	JOEL ROBINSON	0	0	0	2	2	2	8	12	11	37	2	2	1	2
11	AEE16012	KARTHI. P	0	0	0	1	1	1	6	8	8	25	2	2	1	2
12	AEE16013	KRISHNARAJ.S	0	0	0	1	1	1	6	8	7	26	2	2	1	2
13	AEE16014	MOHAN RAJ R	0	0	0	2	2	2	8	9	10	33	2	2	1	2
14	AEE16015	NAVEEN RAJ. R	0	2	0	2	2	2	8	9	10	31	1	1	1	2
15	AEE16016	PUNNOOSE BENNY	0	0	0	2	2	2	8	12	11	37	2	2	2	2
16	AEE16019	SAMUEL MATHEW.G	0	0	0	1	1	1	6	8	8	25	2	2	2	2
17	AEE16020	SNAHASISH SAHA	1	2	2	2	2	2	9	13	13	46	1	2	1	2
18	AEE16022	SURIYA R	2	0	0	1	2	1	6	8	7	28	1	2	1	2
19	AEE16023	VENKATESH S	2	1	2	1	2	2	8	12	10	45	2	2	2	2
20	AEE16024	VIGNESH.B	0	0	0	1	1	1	6	8	8	25	0	0	1	0
21	AEE16026	SREERAG SREEKUMAR	0	0	0	1	1	1	6	8	8	25	0	0	1	2
22	AEE16027	PRAVEEN.D	0	1	2	1	1	1	6	8	8	28	0	0	1	1
23	AEE16028L	AKASH S	1	2	2	2	2	2	8	12	13	44	2	2	1	2
24	AEE16029L	ANITOSH MONDAL	1	2	2	2	2	2	8	12	12	43	1	2	1	2
25	AEE16030L	SANTHOSH KUMAR D	0	1	0	1	1	1	6	8	8	26	2	2	2	2
26	AEE16031L	VAITHIYANATHAN M S	1	0	2	2	2	2	8	9	11	37	2	2	2	2
27	AEE16032L	SRI RAM SURATH KUMAR. V	1	2	2	2	2	2	8	12	13	44	2	2	1	2
28	AEE16033L	SURYA .A	2	2	1	1	1	1	6	8	8	30	0	1	1	0

CAT - II						MODEL EXAM																Assignment-I		
PA5	PA6	PB7	PC8	PC9	TOTAL	PA1	PA2	PA3	PA4	PA5	PA6	PA7	PA8	PA9	PA10	PB11	PC12	PC13	PC14	PC15	PC16	TOTAL	C01	C02	TOTAL
0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	
2	2	10	14	14	50	2	2	2	2	2	2	2	2	2	2	10	14	14	14	14	14	100	10	10	(20M)
2	2	6	8	7	32	0	0	0	1	2	2	2	0	0	0	8	10	10	9	8	9	61	10	8	18
2	2	6	8	12	39	2	2	2	2	2	2	2	2	0	0	8	10	10	10	8	9	71	8	8	16
1	2	6	8	12	36	0	0	0	1	2	2	0	0	0	0	8	9	7	9	8	9	55	9	10	19
2	2	9	12	12	44	1	0	1	2	2	2	2	2	2	2	10	14	13	12	13	13	91	8	9	17
2	2	6	8	12	38	2	2	2	2	2	2	2	2	1	0	8	10	10	10	11	12	78	10	10	20
2	2	9	12	12	43	2	2	2	2	2	2	2	2	1	0	8	10	10	10	14	12	81	10	10	20
2	2	9	12	12	42	2	2	2	2	2	2	2	2	1	0	8	10	10	10	14	12	81	10	9	19
2	2	6	8	12	39	0	0	0	0	1	0	1	2	0	0	0	0	0	0	0	0	4	9	10	19
2	0	6	8	7	30	2	2	2	2	2	2	2	2	0	0	8	10	10	10	8	8	70	8	10	18
1	2	6	8	12	36	0	0	0	1	2	2	0	0	0	0	8	9	8	9	8	9	56	10	10	20
2	2	6	8	9	34	0	0	0	1	2	2	0	0	0	0	8	6	8	9	8	6	50	10	9	19
2	2	6	8	9	34	0	0	0	1	2	2	0	0	0	0	8	6	8	9	8	6	50	9	10	19
2	2	6	8	9	34	0	0	0	1	2	2	0	0	0	0	8	9	8	9	8	9	56	8	9	17
2	2	9	12	12	42	2	0	0	2	2	2	2	2	0	0	8	10	10	10	8	9	67	10	10	20
1	2	6	8	12	37	0	0	0	1	2	2	0	0	0	0	8	9	8	9	8	9	56	8	9	17
2	2	6	8	7	33	0	0	0	1	1	0	0	2	0	2	0	0	8	9	4	7	34	9	8	17
2	2	6	8	7	31	1	0	2	2	2	2	2	2	2	2	10	14	13	12	13	13	92	10	10	20
2	2	9	12	12	43	1	0	0	1	2	2	2	0	0	0	8	10	10	9	8	9	62	10	10	20
2	2	9	12	14	47	2	2	2	2	2	2	2	2	1	2	8	10	10	10	14	12	83	8	8	16
0	2	6	8	8	25	0	0	0	1	2	2	0	0	0	0	8	6	8	9	8	6	50	8	9	17
2	2	6	8	8	29	1	0	0	1	2	2	2	0	0	0	8	10	10	11	8	9	64	9	9	18
0	2	6	8	8	26	2	2	2	2	2	2	2	2	0	0	8	10	10	10	8	10	72	8	8	16
2	2	6	8	9	34	2	2	2	0	2	2	2	2	1	0	8	10	10	10	11	12	76	9	10	19
2	2	6	8	7	31	1	0	0	1	2	2	2	0	0	0	8	10	10	11	8	9	64	8	9	17
2	2	6	8	7	33	0	0	0	1	0	2	1	1	1	1	4	9	8	9	8	9	54	9	8	17
2	2	6	8	12	38	2	2	2	2	2	2	2	2	0	2	8	10	10	10	8	10	74	9	8	17
2	2	6	8	9	34	2	0	0	2	2	2	2	2	0	0	8	10	10	10	8	8	66	9	10	19
0	2	6	8	8	26	1	0	0	1	2	2	2	0	0	0	8	10	10	9	8	9	62	8	8	16

NO OF

Assignment-II			TIVE LEARNING METH			DIRECT ATTAINMENT THROUGH INTERNAL EXAMS(CAT I & II, Model exam, Assignment I,II & ALM											
C03	C04	TOTAL	C05	C06	TOTAL							PA1	PA2	PA3	PA4	PA5	PA6
0	0		0	0								0	0	0	0	0	0
10	10	(20M)	10	10	(20M)	CO1	CO2	CO3	CO4	CO5	CO6	2	2	2	2	2	2
9	9	18	9	10	19	74.14%	79.17%	70.69%	66.67%	64.29%	90.00%	1	1	1	0	0	0
9	9	18	9	9	18	77.59%	81.25%	72.41%	81.25%	64.29%	85.00%	1	2	1	1	1	0
9	9	18	9	9	18	51.90%	60.42%	70.69%	70.83%	64.29%	85.00%	1	1	1	0	0	0
9	8	17	9	8	17	82.76%	91.67%	82.98%	89.58%	92.86%	90.00%	1	1	1	0	2	2
9	9	18	10	9	19	75.86%	85.42%	74.14%	87.50%	89.04%	85.00%	1	2	1	1	1	0
10	9	19	9	9	18	74.14%	72.92%	84.48%	93.75%	78.57%	85.00%	1	2	1	1	1	0
10	9	19	8	9	17	70.69%	68.75%	82.76%	85.75%	75.00%	85.00%	1	2	1	1	1	1
9	8	17	9	9	18	50.00%	56.25%	50.00%	60.42%	82.14%	45.00%	0	0	0	0	0	0
9	9	18	9	10	19	67.24%	85.42%	72.41%	66.67%	90.71%	90.00%	1	1	1	0	2	2
10	9	19	9	8	17	67.24%	75.00%	72.41%	70.83%	64.29%	80.00%	1	2	1	1	1	2
9	9	18	9	9	18	51.72%	60.42%	70.69%	66.67%	53.57%	85.00%	2	0	0	0	0	0
10	10	20	8	8	16	50.00%	60.42%	72.41%	68.75%	80.00%	80.00%	1	2	1	1	1	0
9	9	18	9	10	19	53.45%	70.83%	70.69%	66.67%	50.00%	90.00%	2	0	0	0	0	0
10	10	20	10	10	20	70.69%	79.17%	87.76%	83.33%	67.86%	90.00%	1	2	1	1	1	1
9	8	17	8	7	15	63.79%	72.92%	72.41%	68.75%	80.71%	75.00%	1	1	1	0	0	0
9	9	18	8	8	16	39.66%	58.33%	67.24%	58.33%	80.71%	40.00%	0	0	0	0	0	0
9	9	18	6	9	15	53.66%	91.30%	70.14%	81.25%	82.00%	95.00%	1	1	2	2	2	2
10	10	20	10	10	20	63.79%	66.67%	82.76%	79.17%	67.86%	90.00%	1	1	1	0	0	0
9	9	18	9	9	18	51.03%	77.08%	86.21%	97.92%	85.71%	85.00%	1	1	2	2	2	2
9	9	18	8	9	17	48.28%	60.42%	68.79%	56.25%	50.00%	85.00%	2	0	0	0	0	0
10	9	19	9	9	18	53.62%	64.58%	68.97%	68.75%	64.29%	85.00%	1	1	1	0	0	0
8	8	16	8	8	16	67.24%	68.75%	63.79%	64.58%	64.29%	80.00%	1	1	1	0	2	2
10	9	19	9	10	19	82.76%	85.42%	74.14%	81.25%	78.57%	90.00%	1	2	2	2	2	2
9	8	17	9	9	18	75.86%	79.17%	72.41%	64.58%	64.29%	85.00%	1	1	2	2	2	2
8	7	15	6	9	15	56.90%	58.33%	67.24%	62.50%	60.71%	65.00%	1	1	1	0	2	2
9	8	17	9	9	18	74.14%	91.75%	74.14%	79.17%	75.00%	85.00%	1	1	1	0	2	2
10	9	19	8	8	16	79.31%	85.42%	74.14%	75.00%	57.14%	80.00%	1	2	2	2	2	2
8	8	16	8	8	16	65.52%	62.50%	63.79%	58.33%	60.71%	80.00%	1	2	1	1	1	1
STUDENTS CROSSED SUBJECT THRESHOLD						16	19	24	21	10	25						
TOTAL NO OF STUDENTS						28	28	28	28	28	28						
PERCENTAGE OF ATTAINMENT						57%	68%	86%	75%	36%	89%						
NO OF STUDENTS OBTAINED LEVEL 1						1	0	0	0	1	0						
NO OF STUDENTS OBTAINED LEVEL 2						4	3	0	3	1	0						
NO OF STUDENTS OBTAINED LEVEL 3						19	25	27	25	23	26						

END SEMESTER EXAM											Direct attainment through End Semester Exam						60%
PA7	PA8	PA9	PA10	PB11	PC12	PC13	PC14	PC15	PC16	TOTAL							
0	0	0	0	0	0	0	0	0	0								
2	2	2	2	10	14	14	14	14	14	100	CO1	CO2	CO3	CO4	CO5	CO6	CO1
0	0	0	0	6	10	10	11	12	11	63	66.67%	61.11%	61.11%	66.67%	61.11%	60.00%	40.00%
0	0	0	0	6	7	8	8	7	9	51	55.56%	55.56%	50.00%	38.89%	50.00%	60.00%	33.33%
0	0	0	0	7	9	10	11	10	11	61	61.11%	61.11%	61.11%	55.56%	61.11%	70.00%	36.67%
2	1	0	0	6	10	10	11	11	12	70	66.67%	61.11%	83.33%	77.78%	66.67%	60.00%	40.00%
1	1	1	1	5	5	8	8	9	10	55	44.44%	55.56%	50.00%	61.11%	66.67%	50.00%	26.67%
1	1	1	1	5	5	8	8	7	8	51	44.44%	55.56%	50.00%	50.00%	55.56%	50.00%	26.67%
2	0	0	0	7	7	8	8	9	10	58	55.56%	55.56%	55.56%	61.11%	55.56%	70.00%	33.33%
0	0	0	0	0	0	0	0	0	0	0	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1	0	0	0	6	10	10	11	12	11	68	66.67%	61.11%	83.33%	72.22%	61.11%	60.00%	40.00%
0	0	0	0	6	8	8	8	6	9	53	61.11%	55.56%	61.11%	38.89%	50.00%	60.00%	36.67%
2	2	2	2	3	3	4	4	0	0	28	27.78%	22.22%	22.22%	22.22%	22.22%	30.00%	16.67%
0	0	0	0	7	7	8	8	9	10	55	55.56%	55.56%	50.00%	50.00%	55.56%	70.00%	33.33%
2	2	2	2	3	3	12	4	2	4	38	27.78%	66.67%	22.22%	38.89%	44.44%	30.00%	16.67%
2	0	0	0	7	7	8	8	8	11	58	55.56%	55.56%	55.56%	55.56%	61.11%	70.00%	33.33%
0	0	0	0	4	12	10	11	13	10	63	77.78%	61.11%	61.11%	72.22%	55.56%	40.00%	46.67%
0	0	0	0	0	0	0	0	0	0	0	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2	1	0	0	6	10	10	11	12	11	73	66.67%	77.78%	83.33%	83.33%	61.11%	60.00%	40.00%
0	0	0	0	7	9	10	11	12	11	63	61.11%	61.11%	61.11%	66.67%	61.11%	70.00%	36.67%
2	1	0	0	7	9	10	11	12	11	73	61.11%	77.78%	83.33%	83.33%	61.11%	70.00%	36.67%
2	2	2	2	3	3	7	4	2	4	33	27.78%	33.33%	22.22%	33.33%	44.44%	30.00%	16.67%
0	0	0	0	7	9	10	11	12	11	63	61.11%	61.11%	61.11%	66.67%	61.11%	70.00%	36.67%
1	0	0	0	4	12	10	11	13	10	68	77.78%	61.11%	83.33%	77.78%	55.56%	40.00%	46.67%
2	1	2	2	5	10	13	11	13	10	80	72.22%	94.44%	83.33%	88.89%	77.78%	50.00%	43.33%
2	1	1	1	4	10	12	11	13	10	75	66.67%	88.89%	83.33%	88.89%	66.67%	40.00%	40.00%
2	1	1	1	4	10	10	11	13	10	70	66.67%	61.11%	83.33%	88.89%	66.67%	40.00%	40.00%
1	1	1	1	4	9	10	11	13	10	68	61.11%	61.11%	83.33%	83.33%	66.67%	40.00%	36.67%
2	1	2	2	5	10	13	11	13	10	50	72.22%	94.44%	83.33%	88.89%	77.78%	50.00%	43.33%
2	0	0	0	5	9	8	8	9	8	56	66.67%	55.56%	55.56%	61.11%	44.44%	50.00%	40.00%

NO OF STUDENTS CROSSED SUBJECT THRESHOLD	10	5	9	13	6	7
TOTAL NO OF STUDENTS	28	28	28	28	28	28
PERCENTAGE OF ATTAINMENT	36%	18%	32%	46%	21%	25%
NO OF STUDENTS OBTAINED LEVEL 1	0	0	0	0	0	0
NO OF STUDENTS OBTAINED LEVEL 2	4	8	3	2	5	6
NO OF STUDENTS OBTAINED LEVEL 3	17	16	16	17	15	7

% From Direct attainment through End Semester Exam					40% From Direct attainment through Internal Exams						Direct attainment of CO from 40% Internal and 6			
CO2	CO3	CO4	CO5	CO6	CO1	CO2	CO3	CO4	CO5	CO6	CO1	CO2	CO3	CO4
36.67%	36.67%	40.00%	36.67%	36.00%							69.66%	68.33%	64.94%	66.67%
33.33%	30.00%	23.33%	30.00%	36.00%							64.37%	65.83%	58.97%	55.83%
36.67%	36.67%	33.33%	36.67%	42.00%							59.43%	60.83%	64.94%	61.67%
36.67%	50.00%	46.67%	40.00%	36.00%							73.10%	73.33%	85.17%	82.50%
33.33%	30.00%	36.67%	40.00%	30.00%							57.01%	67.50%	59.66%	71.67%
33.33%	30.00%	30.00%	33.33%	30.00%							56.32%	62.50%	63.79%	67.50%
33.33%	33.33%	36.67%	33.33%	42.00%							61.61%	60.83%	66.44%	74.17%
0.00%	0.00%	0.00%	0.00%	0.00%							20.00%	22.50%	20.00%	24.17%
36.67%	50.00%	43.33%	36.67%	36.00%							66.90%	70.83%	78.97%	70.00%
33.33%	36.67%	20.00%	30.00%	36.00%							63.56%	63.33%	65.63%	48.33%
13.33%	13.33%	13.33%	13.33%	18.00%							37.36%	37.50%	41.61%	40.00%
33.33%	30.00%	30.00%	33.33%	42.00%							53.33%	57.50%	58.97%	57.50%
40.00%	13.33%	20.00%	26.67%	18.00%							40.11%	68.33%	41.61%	46.67%
33.33%	33.33%	33.33%	36.67%	42.00%							61.61%	65.00%	66.44%	66.67%
36.67%	36.67%	43.33%	33.33%	24.00%							72.18%	65.83%	65.63%	70.83%
0.00%	0.00%	0.00%	0.00%	0.00%							15.86%	23.33%	26.90%	23.33%
46.67%	50.00%	50.00%	36.67%	36.00%							75.86%	85.00%	79.66%	82.50%
36.67%	36.67%	40.00%	36.67%	42.00%							62.18%	63.33%	69.77%	71.67%
46.67%	50.00%	50.00%	36.67%	42.00%							69.08%	77.50%	84.48%	89.17%
23.33%	13.33%	20.00%	26.67%	18.00%							35.98%	47.50%	38.85%	42.50%
36.67%	36.67%	40.00%	36.67%	42.00%							60.11%	62.50%	64.25%	67.50%
36.67%	50.00%	46.67%	33.33%	24.00%							73.56%	64.17%	75.52%	72.50%
56.67%	50.00%	53.33%	46.67%	30.00%							76.44%	90.83%	79.66%	85.83%
53.33%	50.00%	53.33%	40.00%	24.00%							70.34%	85.00%	78.97%	79.17%
36.67%	50.00%	53.33%	40.00%	24.00%							62.76%	60.00%	76.90%	78.33%
36.67%	50.00%	50.00%	40.00%	24.00%							66.32%	69.17%	79.66%	81.67%
56.67%	50.00%	53.33%	46.67%	30.00%							75.06%	90.83%	79.66%	83.33%
33.33%	33.33%	36.67%	26.67%	30.00%							66.21%	58.33%	58.85%	60.00%

0%End Semester Exam		InDirect attainment of CO from Course End Survey						10% From InDirect attainment of CO						90% FROM DIRECT		
CO5	CO6	CO1	CO2	CO3	CO4	CO5	CO6	CO1	CO2	CO3	CO4	CO5	CO6	CO1	CO2	CO3
62.38%	72.00%	83.33%	100.00%	100.00%	100.00%	83.33%	83.33%	8%	10%	10%	10%	8%	8%	63%	62%	58%
55.71%	70.00%	100.00%	100.00%	66.67%	83.33%	83.33%	100.00%	10%	10%	7%	8%	8%	10%	58%	59%	53%
62.38%	76.00%	100.00%	100.00%	66.67%	100.00%	83.33%	100.00%	10%	10%	7%	10%	8%	10%	53%	55%	58%
77.14%	72.00%	100.00%	100.00%	66.67%	100.00%	83.33%	100.00%	10%	10%	7%	10%	8%	10%	66%	66%	77%
72.86%	64.00%	83.33%	100.00%	83.33%	100.00%	66.67%	83.33%	8%	10%	8%	10%	7%	8%	51%	61%	54%
64.76%	64.00%	100.00%	100.00%	83.33%	100.00%	83.33%	83.33%	10%	10%	8%	10%	8%	8%	51%	56%	57%
63.33%	76.00%	100.00%	66.67%	83.33%	83.33%	83.33%	100.00%	10%	7%	8%	8%	8%	10%	55%	55%	60%
12.86%	18.00%	100.00%	66.67%	100.00%	66.67%	100.00%	83.33%	10%	7%	10%	7%	10%	8%	18%	20%	18%
60.95%	72.00%	100.00%	66.67%	100.00%	66.67%	66.67%	83.33%	10%	7%	10%	7%	7%	8%	60%	64%	71%
55.71%	68.00%	66.67%	100.00%	100.00%	66.67%	100.00%	83.33%	7%	10%	10%	7%	10%	8%	57%	57%	59%
34.76%	52.00%	100.00%	83.33%	83.33%	83.33%	83.33%	66.67%	10%	8%	8%	8%	8%	7%	34%	34%	37%
53.33%	74.00%	83.33%	66.67%	100.00%	83.33%	100.00%	66.67%	8%	7%	10%	8%	10%	7%	48%	52%	53%
52.38%	54.00%	83.33%	66.67%	100.00%	100.00%	100.00%	83.33%	8%	7%	10%	10%	10%	8%	36%	62%	37%
63.81%	78.00%	100.00%	100.00%	50.00%	66.67%	100.00%	100.00%	10%	10%	5%	7%	10%	10%	55%	59%	60%
57.62%	54.00%	66.67%	83.33%	83.33%	83.33%	100.00%	100.00%	7%	8%	8%	8%	10%	10%	65%	59%	59%
24.29%	16.00%	66.67%	100.00%	66.67%	50.00%	83.33%	66.67%	7%	10%	7%	5%	8%	7%	14%	21%	24%
69.52%	74.00%	83.33%	83.33%	50.00%	83.33%	83.33%	66.67%	8%	8%	5%	8%	8%	7%	68%	77%	72%
63.81%	78.00%	66.67%	100.00%	66.67%	100.00%	66.67%	83.33%	7%	10%	7%	10%	7%	8%	56%	57%	63%
70.95%	76.00%	66.67%	66.67%	83.33%	83.33%	83.33%	50.00%	7%	7%	8%	8%	8%	5%	62%	70%	76%
46.67%	52.00%	83.33%	50.00%	83.33%	83.33%	50.00%	66.67%	8%	5%	8%	8%	5%	7%	32%	43%	35%
62.38%	76.00%	66.67%	50.00%	100.00%	83.33%	66.67%	83.33%	7%	5%	10%	8%	7%	8%	54%	56%	58%
59.05%	56.00%	83.33%	83.33%	83.33%	100.00%	83.33%	100.00%	8%	8%	8%	10%	8%	10%	66%	58%	68%
78.10%	66.00%	66.67%	66.67%	100.00%	66.67%	66.67%	83.33%	7%	7%	10%	7%	7%	8%	69%	82%	72%
65.71%	58.00%	83.33%	66.67%	100.00%	83.33%	66.67%	100.00%	8%	7%	10%	8%	7%	10%	63%	77%	71%
64.29%	50.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0%	0%	0%	0%	0%	56%	54%	69%
70.00%	58.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0%	0%	0%	0%	0%	60%	62%	72%
69.52%	62.00%	66.67%	66.67%	100.00%	66.67%	66.67%	83.33%	7%	7%	10%	7%	7%	8%	68%	82%	72%
50.95%	62.00%	83.33%	66.67%	100.00%	83.33%	66.67%	100.00%	8%	7%	10%	8%	7%	10%	60%	53%	53%

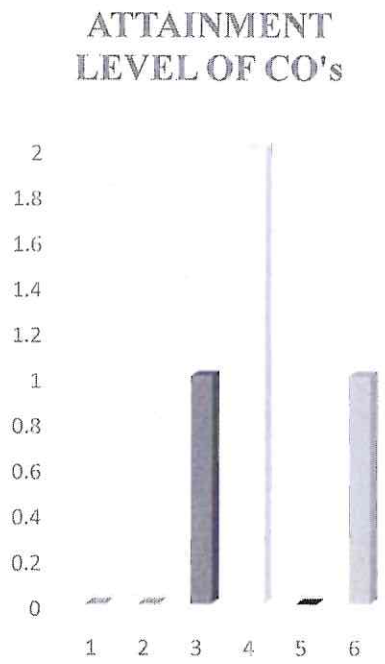
NO OF STUDENTS CROSSE
1
PERCE

ATTAINMENT CO			TOTAL CO ATTAINMENT					
CO4	CO5	CO6	CO1	CO2	CO3	CO4	CO5	CO6
60%	56%	65%	71%	72%	68%	70%	64%	73%
50%	50%	63%	68%	69%	60%	59%	58%	73%
56%	56%	68%	63%	65%	65%	66%	64%	78%
74%	69%	65%	76%	76%	83%	84%	78%	75%
65%	66%	58%	60%	71%	62%	75%	72%	66%
61%	58%	58%	61%	66%	66%	71%	67%	66%
67%	57%	68%	65%	61%	68%	75%	65%	78%
22%	12%	16%	28%	27%	28%	28%	22%	25%
63%	55%	65%	70%	70%	81%	70%	62%	73%
44%	50%	61%	64%	67%	69%	50%	60%	70%
36%	31%	47%	44%	42%	46%	44%	40%	53%
52%	48%	67%	56%	58%	63%	60%	58%	73%
42%	47%	49%	44%	68%	47%	52%	57%	57%
60%	57%	70%	65%	69%	65%	67%	67%	80%
64%	52%	49%	72%	68%	67%	72%	62%	59%
21%	22%	14%	21%	31%	31%	26%	30%	21%
74%	63%	67%	77%	85%	77%	83%	71%	73%
65%	57%	70%	63%	67%	69%	75%	64%	79%
80%	64%	68%	69%	76%	84%	89%	72%	73%
38%	42%	47%	41%	48%	43%	47%	47%	53%
61%	56%	68%	61%	61%	68%	69%	63%	77%
65%	53%	50%	75%	66%	76%	75%	61%	60%
77%	70%	59%	75%	88%	82%	84%	77%	68%
71%	59%	52%	72%	83%	81%	80%	66%	62%
71%	58%	45%	56%	54%	69%	71%	58%	45%
74%	63%	52%	60%	62%	72%	74%	63%	52%
75%	63%	56%	74%	88%	82%	82%	69%	64%
54%	46%	56%	68%	59%	63%	62%	53%	66%
D SUBJECT THRESHOLD			12	17	17	18	9	17
TOTAL NO OF STUDENTS			28	28	28	28	28	28
NTAGE OF ATTAINMENT			43%	61%	61%	64%	32%	61%
ATTAINMENT LEVEL			0	2	2	2	0	2

Academy of Maritime Education and Training Deemed to be UNIVERSITY

DEPARTMENT	**EEE**		**PROGRAM NAME**		**BE EEE-M**		**SUBJECT HALDLED STAFF :**		Dr.D.Lakshmi
YEAR/SEM	**IV / VII**		**BATCH**		**2015-2019**				
SUBJECT CODE/NAME	**UBEE704 - Marine Electrical Protection and Switch Gears**		**ACADEMIC YEAR**		**2017-2018**		**Attainment level**		
SUBJECT THRESHOLD	**65.67%**		**CAY-1**	**CAY-2**	**CAY-3**		**Level 1**	**Level 2**	**Level 3**
NO OF STUDENTS	**28**		**68.00%**	**67.00%**	**62.00%**		**50%-60%**	**60%-70%**	**>70%**

S.No	Process for CO attainment	CO attainment					
		CO1	CO2	CO3	CO4	CO5	CO6
1	% OF DIRECT ATTAINMENT THROUGH INTERNAL EXAMS(CAT I & II, Model exam, Assignment I,II & ALM	57.14%	67.86%	85.71%	75.00%	35.71%	89.29%
2	40% FROM DIRECT ATTAINMENT THROUGH INTERNAL EXAMS	22.86%	27.14%	34.29%	30.00%	14.29%	35.71%
3	% OF DIRECT ATTAINMENT THROUGH END SEMESTER EXAM	35.71%	17.86%	32.14%	46.43%	21.43%	25.00%
4	60% FROM DIRECT ATTAINMENT THROUGH END SEMESTER EXAM	21.43%	10.71%	19.29%	27.86%	12.86%	15.00%
5	40% + 60% OF DIRECT ATTAINMENT	44.29%	37.86%	53.57%	57.86%	27.14%	50.71%
6	90% FROM DIRECT ATTAINMENT	39.86%	34.07%	48.21%	52.07%	24.43%	45.64%
7	% OF INDIRECT ATTAINMENT THROUGH COURSE END SURVEY	91.07%	83.93%	94.64%	94.64%	96.43%	91.07%
8	10% FROM INDIRECT ATTAINMENT THROUGH COURSE END SURVEY	9.11%	8.39%	9.46%	9.46%	9.64%	9.11%
9	90% FROM DIRECT + 10% FROM INDIRECT FOR CO ATTAINMENT	48.96%	42.46%	57.68%	61.54%	34.07%	54.75%
10	ATTAINMENT LEVEL	0	0	1	2	0	1

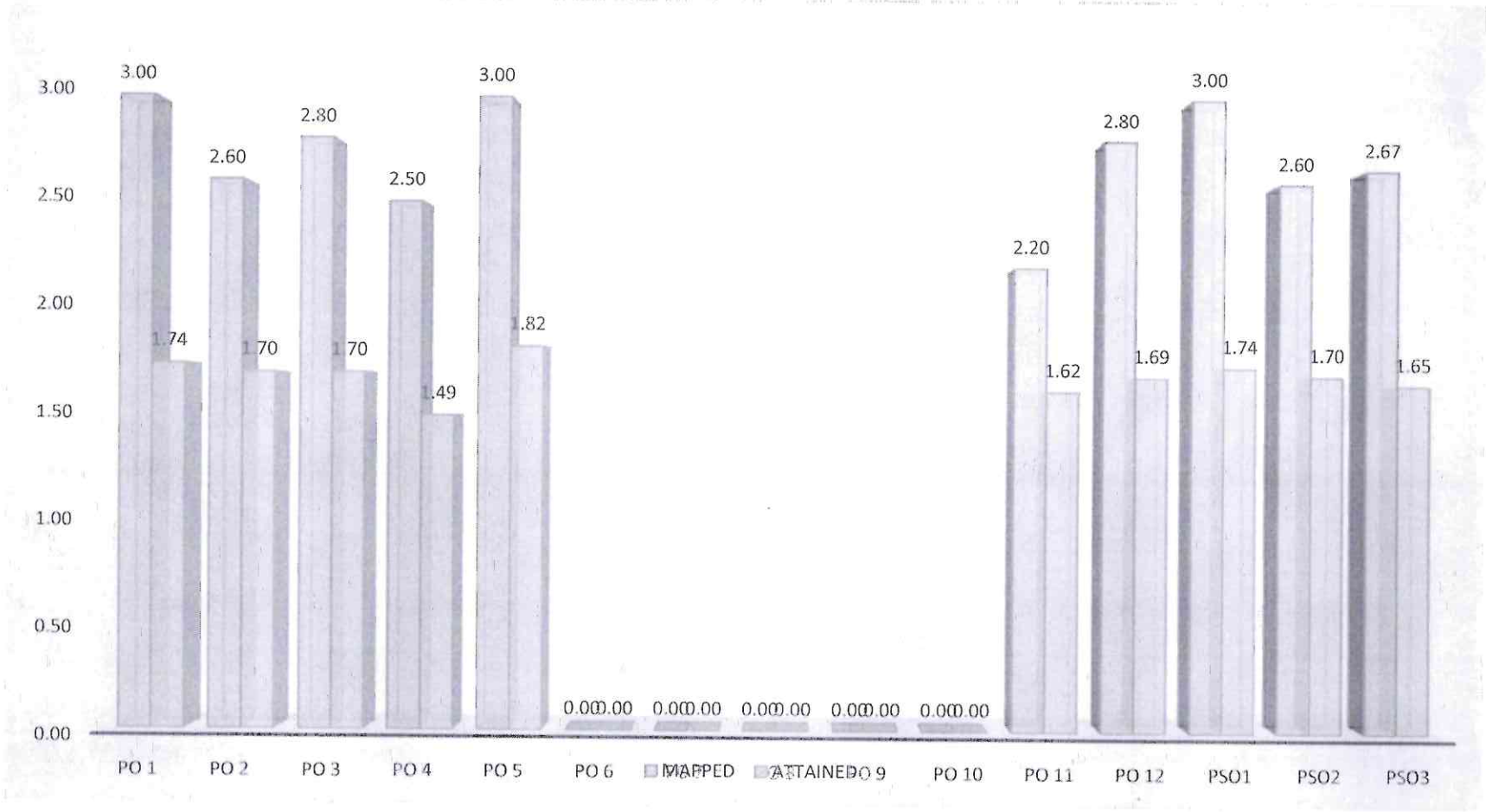


	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO 1	3	-	-	3	-	-	-	-	-	-	-	-	3	-	-
CO 2	3	3	3	2	-	-	-	-	-	-	2	3	3	3	3
CO 3	3	3	2	3	-	-	-	-	-	-	3	3	3	3	-
CO 4	3	3	3	3	-	-	-	-	-	-	1	2	3	3	3
CO 5	3	2	3	2	3	-	-	-	-	-	2	3	3	2	-
CO 6	3	2	3	2	3	-	-	-	-	-	3	3	3	2	2
Avg.	3.0	2.6	2.8	2.5	3.0	0	0	0	0	0	2.2	2.8	3.0	2.6	2.7
	1.1111111	0.962963	1.037037	0.9259259	1.1111111	0	0	0	0	0	0.8148148	1.037037	1.0887097	0.9435484	0.9677419
Mapped	9.26%	8.02%	8.64%	7.72%	9.26%	0.00%	0.00%	0.00%	0.00%	0.00%	6.79%	8.64%	36%	31%	32%

CO 1	CO 2	CO 3	CO 4	CO 5	CO 6	Average
43%	61%	61%	64%	32%	61%	54%
0%	200%	200%	200%	0%	200%	1.33

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO 1	1.29	0.00	0.00	1.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.29	0.00	0.00
CO 2	1.82	1.82	1.82	1.21	0.00	0.00	0.00	0.00	0.00	0.00	1.21	1.82	1.82	1.82	1.82
CO 3	1.82	1.82	1.21	1.82	0.00	0.00	0.00	0.00	0.00	0.00	1.82	1.82	1.82	1.82	0.00
CO 4	1.93	1.93	1.93	1.93	0.00	0.00	0.00	0.00	0.00	0.00	0.64	1.29	1.93	1.93	1.93
CO 5	0.96	0.64	0.96	0.64	0.96	0.00	0.00	0.00	0.00	0.00	0.64	0.96	0.96	0.64	0.00
CO 6	1.82	1.21	1.82	1.21	1.82	0.00	0.00	0.00	0.00	0.00	1.82	1.82	1.82	1.21	1.21
Avg.	1.74	1.70	1.70	1.49	1.82	0.00	0.00	0.00	0.00	0.00	1.62	1.69	1.74	1.70	1.65

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
MAPPED	3.00	2.60	2.80	2.50	3.00	0	0	0	0	0	2.20	2.80	3.00	2.60	2.67
ATTAINED	1.74	1.70	1.70	1.49	1.82	0.00	0.00	0.00	0.00	0.00	1.62	1.69	1.74	1.70	1.65


3.00
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1.00
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1.70
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2.20
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PSO1
PSO2
PSO3
MAPPED
ATTAINED

AMET

ACADEMY OF MARITIME EDUCATION AND TRAINING

DEEMED TO BE UNIVERSITY

(Under Section 3 of UGC Act 1956)

Kanathur, Chennai - 603 112.

ATTENDANCE REGISTER

2019 - 2020

COURSE : B.E

SEMESTER : VII

SUBJECT : Marine Elec. Protection & Switch Gear

GROUP : I

FACULTY NAME : Dr. D. LAKSHMI

AMET
ACADEMY OF MARITIME EDUCATION AND TRAINING
DEEMED TO BE UNIVERSITY
(Under Section 3 of UGC Act 1956)

Attendance Register

Sl.No.	Roll No.	NAME	26/7 1	27/7 2	29/7 3	30/7 4	2/8 5	5/8 6	5/8 7	6/8 8	9/8 9	13/8 10	13/8 11	14/8 12
			1	5	5	3	1	5	6	3	1	1	3	1
1	EE 297	Abiraj.B	/	/	/	/	/	/	/	/	/	/	/	/
2	298	Avinash Vijay	/	/	/	/	/	/	/	/	a	/	/	/
3	299	Azaruttheen.S	/	/	/	/	/	a	a	/	/	a	a	/
4	300	Beer Mohamed Uvais.N	/	a	/	/	/	a	a	a	a	/	/	a
5	301	Dharun.S	a	a	/	/	/	/	/	/	/	a	a	a
6	302	Dinesh Kumar.M	/	/	/	/	/	/	/	/	/	a	/	/
7	303	Ganesh Babu.K.	/	/	/	/	/	/	/	/	a	/	/	/
8	304	Gokulakrishnan.B	a	a	/	a	/	/	/	/	/	/	/	a
9	305	Immanuel Peter.	a	a	/	/	/	/	/	/	/	/	/	/
10	306	Joel Robinson	/	/	/	/	/	/	/	/	/	/	/	a
11	308	Karthi P	/	a	a	a	a	a	a	/	/	/	/	/
12	308	Krishnaraj.S	/	a	/	/	/	a	a	a	a	/	/	/
13	310	Mohan raj R	/	/	/	/	/	/	/	/	a	a	a	a
14	311	Naveen raj.R	/	/	/	/	/	a	a	/	/	/	/	/
15	312	Punnoose Benny	a	a	/	/	/	/	/	/	/	a	a	a
16	314	Rohit kumar.												
17	315	Samuel Mathew.G	a	a	/	a	/	/	/	/	a	a	/	/
18	316	Snahasish Saha.	a	a	/	/	/	/	/	/	/	/	/	/
19	318	Suriya.R.	/	/	a	/	/	/	/	/	/	/	/	/
20	319	Venkatesh.S	/	/	/	/	a	/	/	/	/	/	/	/
21	320	Vignesh.B	a	a	/	/	/	/	/	a	/	a	a	a
22	321L	Sriram Surath kumar	a	a	/	a	a	a	a	/	a	a	a	/
23	322	Ivan Celio Alven Mayer												
24	323	Sreerag Sreekumar	a	a	/	/	/	/	/	/	/	/	/	/
25	324	Praveen.D	/	a	/	/	a	a	a	/	/	/	/	/
26	325L	Akash.S	/	/	/	/	/	/	/	/	/	/	/	/
27	326L	Anitosh Mondal	a	/	/	/	/	/	/	/	/	a	a	a
28	327L	Santhoshkumar.D	/	a	/	/	a	a	a	/	/	/	/	/