

Government of Karnataka
Department of Technical Education
Board of Technical Examinations, Bengaluru

Course Title: BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	Course Code : 15EE01E
Semester : I / II/ III	Course Group : Core
Teaching Scheme (L:T:P) : 4:0:0 (in Hours)	Credits : 4 Credits
Type of course : Lecture + Assignments	Total Contact Hours : 52
CIE : 25 Marks	SEE : 100 Marks
Programme: Mechanical (GL), Mechanical (Instr.), MTT, HPT, WSM, Automobile, Mechatronics, Printing Technology, Textile Technology, Ceramics, Mining Engg., Metallurgical Engg., Aeronautical Engineering.	

Pre-requisites	:Mathematics and Science in Secondary Education.
Course Objectives	:To introduce the concept of electrical current, voltage, power, energy, electrical circuits, magnetic fields, electromagnetic induction and alternating current. Introduction of Transformers, DC Generators, AC Generators and Motors, protective devices and Earthing. Introduction to Battery, UPS, electronic components and their applications.

Course Unit-wise Weightage of Marks:

Unit Nos.	Topics	Teaching Hours	SEE Max. Marks
1	Electricity and DC Circuits	10	30
2	Electromagnetism and DC Generators	6	15
3	AC Fundamentals, Transformers and AC Generators	10	30
4	Electric Motor Drives	9	25
5	Protective Devices, UPS and Estimation	8	20
6	Electronic Components and Applications	9	25
Total		52	145

Course Outcomes

On successful completion of the course, the student will be able to:

1. Understand basics of Electricity and Ohm's law and DC circuits
2. Understand Faraday's laws of electromagnetic induction and DC Generator.
3. Understand AC fundamentals, AC generator and Transformer.
4. Differentiate the applications of DC & AC motors , necessity of starters.
5. Understand protective devices like Fuses, MCB, and ELCB and earthing and safety measures, Batteries and UPS.
6. Understand electronic components and their applications, working of rectifiers and logic gates.

Composition of Educational Components

Questions for CIE and SEE will be designed to evaluate the various educational components (Bloom's Taxonomy) such as:

Sl. No.	Educational Component	Weightage (%)	Total Marks (145)
1	Remembering	10	15
2	Understanding	70	100
3	Application	20	30
Total		100	145

Course Outcome linkage to Cognitive Level

Cognitive Level Legend: R- Remember, U- Understand, A- Application

Course Outcome		CL	Linked PO	Teaching Hrs
CO1	Understand basics of Electricity and Ohm's law and DC circuits	<i>R/U/A</i>	1,2,10	10
CO2	Understand Faraday's laws of electro-magnetic induction and DC Generator.	<i>R/U</i>	1,2,10	6
CO3	Understand AC fundamentals, AC generator and Transformer.	<i>R/U/A</i>	1,2,10	10
CO4	Differentiate the applications of DC & AC motors, necessity of starters.	<i>R/U</i>	2,10	9
CO5	Understand protective devices like Fuses, MCB, and ELCB and earthing and safety measures, Batteries and UPS.	<i>U/A</i>	1,2,10	8
CO6	Understand electronic components and their applications, working of rectifiers and logic gates.	<i>U/A</i>	1,2,10	9
			Total sessions	52

COURSE CONTENT AND BLUE PRINT OF MARKS FOR SEE:

Unit No	Unit Name	Hour	Max. Marks per Unit	Questions to be set for (5marks) PART - A			Questions to be set for (10marks) PART - B			Marks weightage (%)
				R	U	A	R	U	A	
1	Electricity and DC Circuits	10	30	1	1	-	-	1	1	20
2	Electromagnetism and DC Generators	6	15	1	-	-	-	1	-	10
3	AC Fundamentals, Transformers and AC Generators	10	30	1	-	1	-	2	-	20
4	Electric Motor Drives	9	25	-	1	-	1	1	-	18
5	Protective Devices, UPS and Estimation	8	20	-	1	1	-	1	-	14
6	Electronic Components and Applications	9	25	-	1	-	-	1	1	18
Total		52	145	9 (45 Marks)			10 (100 Marks)			100

Course-PO Attainment Matrix

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
Basic Electrical and Electronics Engineering.	3	3	-	-	-	-	-	-	-	3

LEVEL 3- HIGHLY ADDRESSED, LEVEL 2-MODERATELY ADDRESSED, LEVEL 1-LOW ADDRESSED.
 METHOD IS TO RELATE THE LEVEL OF PO WITH THE NUMBER OF HOURS DEVOTED TO THE COS WHICH ADDRESS THE GIVEN PO.
 IF $\geq 40\%$ OF CLASSROOM SESSIONS ADDRESSING A PARTICULAR PO, IT IS CONSIDERED THAT PO IS ADDRESSED AT LEVEL 3
 IF 25 TO 40% OF CLASSROOM SESSIONS ADDRESSING A PARTICULAR PO, IT IS CONSIDERED THAT PO IS ADDRESSED AT LEVEL 2
 IF 5 TO 25% OF CLASSROOM SESSIONS ADDRESSING A PARTICULAR PO, IT IS CONSIDERED THAT PO IS ADDRESSED AT LEVEL 1
 IF $< 5\%$ OF CLASSROOM SESSIONS ADDRESSING A PARTICULAR PO, IT IS CONSIDERED THAT PO IS CONSIDERED NOT-ADDRESSED.

Course Content:

Unit 1

Electricity and DC Circuits: Introduction to sources of electrical energy, advantages, effects of electric current and its applications. Electrical current, voltage, emf, potential difference, electric work, power, energy & their units and measuring instruments. Conductors, insulators and semiconductors. Resistance, Ohm's law and limitations, Problems on ohms law. Problems on power and energy. Resistances connected in series, parallel, series and parallel combinations. Simple problems on resistance combinations..Horse Power and BHP

Unit 2

Electromagnetism: Magnetic field, Magnetic flux, Magneto motive force, flux density, Reluctance and their units. permeability. Faraday's laws, statically and dynamically induced EMF, self and mutual induced emf. Inductance, mutual inductance and their units.

DC Generator: Construction and working.

Unit 3

Fundamentals of AC Circuits: Sinusoidal voltage, current, amplitude, time-period, cycle, frequency, phase, phase difference, RMS value, Average value, form factor, and their units. Simple Problems. Capacitance, capacitive reactance, inductive reactance, impedance and their units. Power, power factor and units. Problems on reactance, impedance, power and power factor in series R-L,RC,RLC circuits. Difference between single phase and three phase power. Advantages of three phase power over single phase power.

Transformers: construction working, application, ratings.

AC Generators: construction working, applications, ratings.

Unit 4

Electric Motor Drives: DC motors, types, applications and selection criteria. AC motors, single and three phase motors, selection criteria, FHP motors applications and selection criteria, applications of single phase and three-phase motors. Name plate details of single phase and 3 phase motors. Necessity of starters for AC motors, types and applications. Advantages of 3 phase motors over single phase motors. List out the motors used for following purposes; Mining, Printing, Textiles, Cement, Mechanical, Aeronautical and Chemical industries by giving selection criteria. Importance of Motor enclosures, types, and their applications.

Unit 5

Protective Devices, UPS& Estimation: Necessity of protective devices, ratings, rewirable, cartridge, and HRC fuses. Types of switches, MCB and ELCB. Necessity of electrical earthing and types. General safety precautions to prevent electrical accident, first aid in electric shock. Cell, battery, types of batteries, conditions of fully charged and discharged battery of lead acid battery, sealed maintenance free (SMF) battery. Selection of batteries. UPS, types, applications and selection criteria of UPS.

i) Plan and estimate the cost of electrical wiring for one 3mX3m room having consisting of 2 tube lights, 1 ceiling fan, 2 three pin socket.

ii) Plan and estimate the cost of electrical wiring for one lathe for three phase wiring with MCBs, starters, Iron clad switches, and HRC fuses.

Unit 6

Electronic Components and Applications: Intrinsic and extrinsic semiconductors, P and N type materials. Diode, types and their applications. Forward and Reverse bias characteristics of a Diode. Half wave, full wave and bridge rectifiers without filter. Zener diode as a voltage regulator. Transistor (BJT) working, applications, and transistor as a switch. SCR working and industrial applications. Timers, applications. Relays, applications. Logic gates – OR, AND, NOT, EX-OR, NAND, and NOR, meaning and advantages of IC.

Reference Books:

1. ABC of Electrical Engineering by B. L. Theraja and A. K. Theraja, S Chand Publishers, New Delhi, 2014 Edition.
2. Basic Electrical and Electronics Engineering by S. K. Bhattacharya, Pearson Education India, 2012 Edition.
3. Electronic Devices and Circuits by I. J. Nagrath, PHI Learning Pvt. Ltd., 2007 Edition.
4. Basic Electrical Engineering by V. Mittle and Arvind Mittle, McGrawHill Companies, 2005 Edition.

e-Resources

5. http://jenko.eu/marjan/fpp_izredni/knjiga_df/df_1_digital_concepts.pdf
6. <http://www.facstaff.bucknell.edu/mastascu/elessonshtml/eeindex.html> - Welcome to Exploring Electrical Engineering.
7. Fundamentals Handbook of Electrical Science, Module 1, Basic Electrical Theory, Department of Energy, U. S. Department of Energy, June 1992.
8. <http://www.freeengineeringbooks.com/Electrical/Basic-Electrical-Engineering.php>
9. <http://www.electrical-engineering-portal.com>

Course Contents with Lecture Schedule:

Lesson No./ Session No.	Contents	Duration
	Electricity and DC Circuits:	10 Hours
1.	Introduction to sources of electrical energy, advantages,	01 Hour
2.	Effects of electric current and its applications.	01 Hour
3.	Electrical current, voltage, emf, potential difference	01 Hour
4.	Electric work, power, energy & their units and measuring instruments.	01 Hour
5.	Problems on power and energy	01 Hour
6.	Conductors, insulators and semiconductors. Resistance.	01 Hour
7.	Ohm's law and limitations.	01 Hour
8.	Problems on ohms law	01 Hour
9.	Resistances connected in series, parallel, series and parallel combinations. Horse Power and BHP.	01 Hour
10.	Simple problems on resistance combinations.	01 Hour
	Electromagnetism and DC Generator	6 Hours
11.	Magnetic field, Magnetic flux, Magneto motive force	01 Hour
12.	Flux density, Reluctance and their units. Permeability.	01 Hour
13.	Faraday's laws, Statically and dynamically induced EMF,	01 Hour
14.	Self and mutual induced emf.	01 hour
15.	Inductance, mutual inductance and their units.	01 Hour
16.	DC Generator- construction and working	01 Hour
	Fundamentals of AC Circuits, Transformers, and AC Generators	10 Hours
17.	Sinusoidal voltage, current, amplitude, time - period, cycle, frequency,	01 Hour
18.	Phase, phase difference, RMS value, Average value, form factor, and their units. Problems on sinusoidal wave.	01 Hour

Lesson No./ Session No.	Contents	Duration
19.	Capacitance, capacitive reactance, inductive reactance, impedance and their units.	01 Hour
20.	Power, power factor and units. Difference between single phase and three phase power.	01 Hour
21.	Problems on reactance, impedance , power and Power factor.	01 Hour
22.	Advantages of three phase power over single phase power	01 Hour
23.	Transformers- construction and working,	01 Hour
24.	Transformers- ratings and applications.	01 Hour
25.	AC Generators- construction working,	01 Hour
26.	AC Generators-ratings and applications.	01 Hour
	Electric Motor Drives	9 Hours
27.	DC Motors, types, applications	01 Hour
28.	Selection criteria of DC motors.	01 Hour
29.	AC motors, single and three phase, Advantages of 3 phase motors over single phase motors.	01 Hour
30.	Selection criteria for AC motor selection	01 Hour
31.	FHP motors applications and selection criteria,	01 Hour
32.	Applications of single phase and three-phase motors.	01 Hour
33.	Name plate details of single phase and 3 phase motors. Necessity of starters for AC motors, types and applications.	01 Hour
34.	List out the motors used for following purposes; Mining, Printing, Textiles, Cement, Mechanical, Aeronautical and Chemical industries by giving selection criteria.	01 Hour
35.	Motor enclosures, importance and their applications.	01 Hour
	Protective Devices, Batteries ,UPS and Estimation	8Hours
36.	Necessity of protective devices. Types	01 Hour

Lesson No./ Session No.	Contents	Duration
37.	Rewire-able fuse, fuse cartridge, and HRC fuse. Types of switches, MCB and ELCB. and Ratings of protective devices.	01 Hour
38.	Necessity of electrical earthing and types. General safety precautions and electric shock treatment.	01 Hour
39.	Cell, battery, types of batteries, conditions of fully charged and discharged battery of lead acid battery	01 Hour
40.	Sealed maintenance free (SMF) battery. Selection of batteries.	01 Hour
41.	UPS, types, applications and selection criteria of UPS.	01 Hour
42.	Plan and estimate the cost of electrical wiring for one 3mx3m room consisting of 2 tube-lights, 1 ceiling fan, 2 three pin socket.	01 Hour
43.	Plan and estimate the cost of electrical wiring for One lathe for three phase wiring with MCBs, starters, Iron clad switches, and HRC fuses.	01 Hour
	Electronic Components and Applications	9 Hours
44.	Intrinsic and extrinsic semiconductors, P and Ntype materials.	01 Hour
45.	Diode, types and their applications. Forward and Reverse bias characteristics of a Diode.	01 Hour
46.	Half wave and full wave bridge rectifiers without filter.	01 Hour
47.	Zener diode as a voltage regulator. Transistor (BJT) -working,	01 Hour
48.	Transistor types, applications, and transistor as a switch.	01 Hour
49.	SCR working and industrial applications.	01 Hour
50.	Timers, applications.	01 Hour
51.	Relays, applications.	01 Hour
52.	Logic gates–OR,AND,NOT, EX-OR, NAND, and NOR, advantages and applications of IC.	01 Hour

Course Delivery:

The Course will be delivered through lectures, classroom interaction, animations, group discussion, exercises and assignments.

Course Assessment and Evaluation

	What		To Whom	Frequency	Max Marks	Evidence Collected	Course Outcomes
Direct Assessment	CIE (Continuous Internal Evaluation)	I A Tests	Students	Three IA tests for Theory: (Average marks of Three Tests to be computed).	20	Blue Books	1 to 6
		Classroom Assignments		Student Activities	05	Log of Activity	1 to 6
				TOTAL	25		
	SEE (Semester End Examination)	End Exam	Students	End of the Course	100	Answer Scripts at BTE	ALL CO's
Indirect Assessment	Student Feedback on course		Students	Middle of The Course	Feed Back Forms		1-3 Co's
	End Of Course Survey			End of The Course	Questionnaires		All Co's

*CIE – Continuous Internal Evaluation

*SEE – Semester End Examination

Note: I.A. test shall be conducted for 20 marks. Average marks of three tests shall be rounded off to the next higher digit.

Note to IA verifier: The following documents to be verified by CIE verifier at the end of semester

1. Blue books (20 marks)
2. Student suggested activities report for 5 marks and should be assessed on RUBRICS
3. Student feedback on course regarding Effectiveness of Delivery of instructions & Assessment Methods.

Suggested Student Activities:

Each Student has to prepare a self-hand written report of 3 pages or solved in a blue book considering any one of the following topics.

1. Using suitable meters/ instruments give the practical working circuits to measure Resistance, Current, Voltage, Power and Energy in DC and AC (Single phase) Circuits.
2. Report on different materials used for electromagnets with their properties.
3. Applications of Electro Magnetic Induction, statically induced and dynamically induced emf, self and mutual induced emfs.
4. Practical applications of Single Phase AC supply and Three phase AC supply with their operating voltages and other electrical parameters.
5. Report on types of starters and enclosures used for various industrial applications of AC motors.
6. Visit nearby Battery charging and inverter (UPS) shop or show room and prepare a report of the visit.
7. Visit nearby electronics shop/ market and identify the different diodes and rectifier with their ratings.
8. Prepare a wiring plan for a building/ lab/ room, etc.

MODEL OF RUBRICS / CRITERIA FOR ASSESSING STUDENT ACTIVITY (Course Coordinator)

Dimension	Scale					Students score (Group of five students)				
	1 Unsatisfactory	2 Developing	3 Satisfactory	4 Good	5 Exemplary	1	2	3	4	5
1	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	3				
2	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	2				
3	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	5				
4	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	4				
Note: Concerned faculty (Course coordinator) must devise appropriate rubrics/criteria for assessing Student activity for 5 marks One activity on any one CO (course outcome) may be given to a group of FIVE students Grand Average/Total						14/4				
						=3.5				
						≈4				

**Example only: MODEL OF RUBRICS / CRITERIA FOR ASSESSING STUDENT ACTIVITY-
Task given- Industrial visit and report writing**

Dimension	Scale					Students score (Five students)				
	1 Unsatisfactory	2 Developing	3 Satisfactory	4 Good	5 Exemplary	1	2	3	4	5
1. Organisation	Has not included relevant info	Has included few relevant info	Has included some relevant info	Has included many relevant info	Has included all relevant info needed	3				
2. Fulfill team's roles & duties	Does not perform any duties assigned	Performs very little duties	Performs partial duties	Performs nearly all duties	Performs all duties of assigned team roles	2				
3. Conclusion	Poor	Less Effective	Partially effective	Summarises but not exact.	Most Effective	5				
4. Conventions	Frequent Error	More Error	Some Error	Occasional Error	No Error	4				
Total marks						14/4=3.5 ≈4				

FORMAT OF I A TEST QUESTION PAPER (CIE)

Test/Date and Time	Semester/year	Course/Course Code	Max Marks			
Ex: I test/6 th week of sem 10-11 Am	I/II SEM		20			
	Year:					
Name of Course coordinator : CO's: _____			Units: __			
Question no	Question		MARKS	CL	CO	PO
1						
2						
3						
4						

Note: Internal choice may be given in each CO at the same cognitive level (CL).

MODEL QUESTION PAPER (CIE)

Test/Date and Time	Semester/year	Course/Course Code	Max Marks		
2 nd Test/ 10 th week, 9 Feb 16, 10-11 AM	I SEM, Mech. Engg.	Basic Electrical and Electronics Engg.	20		
	Year: 2015-16	Course code: 15EE01E			
Name of Course coordinator:					
Units Covered :3 and 4					
Course Outcomes : 3 and 4					
Instruction : (1). Answer all questions (2). Each question carries five marks					
Question No.	Question	CL	CO	PO	
1	Define and state the units of i) Maximum value ii) Instantaneous value and iii) form factor.	R	3	1,2,10	
2	Explain the construction of an AC Generator. OR A resistance of 100 Ω is connected in series with a capacitance of 150 μ F. If this is connected to 200V, 50 Hz supply, find i) Impedance ii) Current and iii) Power factor	U A	3	1,2,10	
3	State the necessity of Starters for AC Motors. List the types and applications.	R	4	2, 10	
4	Explain the need of mechanical enclosures. List the types and applications. OR List out the applications of DC and AC Motors.	U U	4	2, 10	

CL: Cognitive Level, R-Remember, U-Understand, A-Application, PO: Program Outcomes

Model Question Paper:

Code:15EE01E

I /II Semester Diploma Examination

BASIC OF ELECTRICAL AND ELECTRONICS ENGINEERING

(Common for Mechanical (GL), Mechanical (Instr.), MTT, HPT, WSM, Mechatronics, Printing Technology, Textile Technology, Ceramics, Mining Engg., Metallurgical Engg..)

Time: 3 Hours]

[Max Marks: 100

- Note:** i) Answer any SIX questions from PART - A. Each question carries 5 marks.
ii) Answer any SEVEN Questions from PART - B. Each question carries 10 marks.

PART – A

1. State the Sources of Electrical Energy.
2. Define and mention the SI units of i) Electric Current ii) Voltage
3. State Faraday's First and Second Laws of Electromagnetic Induction.
4. Define i) RMS value ii) Average value and write equations.
5. State the working principle of a Transformer.
6. State Five applications of DC motors.
7. Write the name plate details of a three phase Induction Motor.
8. Distinguish between MCB and ELCB.
9. State the advantages of Integrated Circuits over discrete components.

PART – B

10. a. State Ohm's Law and mentions the limitations. 4
b. Three resistances of 6 Ω , 4 Ω and 10 Ω are connected in series, across supply of 100 V, Find
i) Effective resistance of the circuit.
ii) Total current in the circuit.
iii) Current through each resistance 6
11. a. Define i) Electric Power ii) Electric Energy and
mention the meters used to measure them. 4
b. A house consists of two bulbs of 100W each, three bulbs of 60W each and one

- fluorescent lamp of 40W. If they are used for 4 hours a day, find monthly consumption charges at Rs. 2.70 per unit. 6
12. a. Define with SI Units. i) Magnetic Flux ii) Magneto motive Force. 4
 b. Distinguish between Statically Induced and Dynamically Induced emf. 6
13. a. Explain the construction of DC Generator. 4
 b. Draw a sinusoidal waveform and mark the following
 i) Maximum value
 ii) Instantaneous value
 iii) cycle 6
- 14.a. State Five advantages of 3-phase power supply over 1-phase power supply. 5
 b. Explain the construction of an AC Generator. 5
15. a. State Five applications of FHP motors. 5
 b. State the necessity of starters for 3-phase induction motors and list the types. 5
16. a. State the advantages of three phase motors over single phase motors. 5
 b. Explain the need for different motor enclosures and state the applications. 5
17. a. State any five general electrical safety precautions. 5
 b. Mention the conditions for fully charged and discharged lead acid battery. 5
18. a. Explain the selection criteria of an un-interrupted power supply (UPS). 4
 b. Distinguish between Intrinsic and extrinsic semiconductors. 6
19. a. Explain the working of a full wave diode bridge rectifier with a neat sketch. 5
 b. Draw the logic symbol and write the truth table for
 i) NAND gate and ii) NOR gate. 5

Model Question Paper Bank

Course Title: **BASIC ELECTRICAL AND
ELECTRONICS ENGINEERING**

Course Code : **15EE01E**

All the questions carry 5 marks each.

Unit 1 - Electricity and DC Circuits

Cognitive Level: REMEMBER

1. State the Sources of Electrical Energy.
2. State Five effects of Electrical Current with an example each.
3. Define and mention the SI units of i) Electric Current ii) Voltage.
4. Define and mention the SI units of i) Potential Difference ii) Resistance
5. Define i) Electric Current ii) Voltage and mention the meters used to measure them.

Cognitive Level: UNDERSTAND

6. Mention any five applications of Electrical Energy.
7. State five advantages of electrical energy over other forms of energy.
8. Distinguish between Conductors and Insulators.
9. Distinguish between Conductors and Semi-conductors.
10. State Ohm's Law and mentions its limitations.
11. State and explain Ohm's Law.
12. Define Horse power and Brake Horse power

Cognitive Level: APPLICATION

13. Determine the equivalent resistance of three resistances R_1 , R_2 and R_3 when
14. connected in series across a supply voltage of V volts.
15. Determine the equivalent resistance of three resistances R_1 , R_2 and R_3 when connected in parallel across a supply voltage of V volts.
16. Three resistances of $6\ \Omega$, $4\ \Omega$ and $10\ \Omega$ are connected in series, across supply of $100\ V$, Find i) Effective resistance of the circuit.
ii) Total current in the circuit.
iii) Current through each resistance
iv) Voltage drop across each resistance.
17. Define i) Electric Power ii) Electric Energy and mention the meters used to measure them.
18. Define Electric Power and write the three equations of electrical power with current, voltage and resistance.
19. A $100\ \text{watt}$ lamp is used for $6\ \text{hours}$ and a $60\ \text{watt}$ lamp is used for $4\ \text{hours}$ a day. Find i) Energy consumed per month and

- ii) Cost of energy if each unit costs Rs.2.70
20. A house consists of two bulbs of 100W each, three bulbs of 60W each and one fluorescent lamp of 40W. If they are used for 4 hours a day, find monthly consumption charges at Rs. 2.70 per unit.

Unit 2 – Electromagnetism

Cognitive Level: REMEMBER

21. Define with SI units. i) Flux density ii) Reluctance.
22. Define with SI units. i) Magnetic flux ii) Magneto Motive Force.
23. Define with SI units i) Permeability ii) Reluctance.
24. Define with SI units a) Inductance b) Mutual inductance

Cognitive Level: UNDERSTAND

25. State Faraday's First and Second Laws of Electromagnetic Induction.
26. Distinguish between Statically Induced and Dynamically Induced e.m.f.
27. Distinguish between self-induced and mutual-induced e.m.f.
28. Explain with a sketch statically induced emf with an example.
29. Explain with a sketch dynamically induced emf with an example.
30. Explain the construction of DC Generator.
31. Explain the working of a DC Generator.

Unit 3 - Fundamentals of AC Circuits

Cognitive Level: REMEMBER

32. Define i) RMS value ii) Average value and write equations.
33. Define the following with reference to a sinusoidal waveform
 - a) Maximum value
 - b) Instantaneous value
 - c) Form factor.
34. Define with equations, i) Capacitive reactance ii) Inductive reactance.
35. What is a transformer? State its applications.
36. What is an AC generator? State its applications.
37. Define with SI units. i) Frequency and ii) Time period.

Cognitive Level: UNDERSTAND

38. Explain with illustration i) phase and ii) phase difference.
39. Draw a sinusoidal waveform and mark the following
 - i) Maximum value
 - ii) Instantaneous value

- iii) cycle
- iv) Time Period.
- 40. The instantaneous value of current is given by $i = 50 \sin 520 t$, find Instantaneous value at $t = 5\text{ms}$, Maximum value, Frequency and Time period
- 41. Explain Impedance, mention the SI unit and also write the equation.
- 42. Explain the construction of an AC Generator.
- 43. State the working principle of a transformer.

Cognitive Level: APPLICATION

- 44. A resistance of 100Ω is connected in series with a capacitance of $150 \mu\text{F}$. If this is connected to a 200 V , 50 Hz supply, Find Capacitive reactance, Impedance of the circuit, Power factor, and Current
- 45. A resistance of 20 is connected in series with a inductance of 0.07 H . If this is connected to a 200V , 50 Hz supply, find Inductive reactance, Impedance, Power factor, and current
- 46. Define power factor and explain its effect on electrical power.
- 47. Compare between three phase power supply and single phase power supply.
- 48. State Five advantages of three phase power supply over single phase power supply.
- 49. Explain the working principle of an AC generator.
- 50. Explain the construction of a transformer.
- 51. Write the ratings of a typical transformer.
- 52. Write the ratings of a typical AC generator.

Unit 4 - Electric Motor Drives

Cognitive Level: REMEMBER

- 53. What is a DC motor? List the types of DC motors.
- 54. State five applications of DC motors.
- 55. What is an AC motor? List the types of AC motors.
- 56. State the applications of single phase AC motors.
- 57. State the applications of three phase AC motors.
- 58. State the necessity of starters for three phase induction motors and list the
- 59. types.
- 60. State the advantages of three phase motors over single phase motors.

Cognitive Level: UNDERSTAND

- 61. Explain briefly the selection of DC motors.
- 62. Compare single phase and three phase AC motors.
- 63. Explain briefly the selection of single phase and three phase AC motors.
- 64. What is FHP motor? List the applications of FHP motors.

65. Explain briefly the selection of FHP motors.
66. What is the importance of name plate details of an AC motor. Give one
67. example for single phase and three phase AC motor.
68. State the necessity of starters for three phase AC motors and list the types and
69. applications.
70. List out the various industrial applications of DC motors.
71. List out the selection criteria of DC motors for various industrial applications.
72. List out the various industrial applications of AC motors.
73. List out the selection criteria of AC motors for various industrial applications.
74. Explain the need of mechanical enclosures for motors and state the applications.
75. List the different types of mechanical enclosures for motors with their applications.

Unit 5 - Protective Devices, UPS and Estimation

Cognitive Level: UNDERSTAND

76. State the meanings of over voltage, under voltage and normal voltage w.r.t AC.
77. State the meanings of over loading, over and short circuit currents.
78. What is fuse? List the types.
79. List the applications of re-wire able, cartridge, and HRC fuses.
80. List out the different types of switches with their symbols.
81. State the sequence of steps for shock treatment.
82. State the definitions of Cell and Battery. List the types of Batteries.
83. What are SMF batteries? List the advantages over conventional batteries.
84. What are the functions of UPS.

Cognitive Level: APPLICATION

85. Explain the necessity of Protective devices. List the types.
86. Distinguish between MCB and ELCB.
87. Explain the necessity of electrical Earthing. List types of earthing.
88. Explain the necessity of earthing an electrical equipment..
89. State any five general electrical safety precautions.
90. Explain briefly electric shock treatment.
91. Explain the ratings of Battery.
92. Differentiate Primary and Secondary Batteries.
93. Mention the conditions for fully charged and discharged Lead Acid Battery.
94. Explain the selection of batteries.
95. What is an UPS and its rating? List the different types.
96. Explain the selection criteria of an Un-interrupted Power Supply.
97. Plan and estimate the cost of electrical wiring for one 3mX3m room having consisting of 2 tubelights, 1 ceiling fan, 2 three pin socket .
98. Plan and estimate the cost of electrical wiring for One lathe for three phase wiring with MCBs, starters, Iron clad switches ,and HRC fuses

Unit 6 - Electronic Components and Applications

Cognitive Level: UNDERSTAND

99. What are semiconductors? List the properties.
100. What are semiconductors? List the types and applications.
101. What is a Diode. List the types and their applications.
102. With a neat diagram explain the working of half wave rectifier.
103. What is a transistor? Mention the types with their symbols.
104. Explain the operation of Zener diode as a Voltage Regulator.
105. List the applications of Timers.
106. What is a Relay. List the types.
107. List the applications of Relays.
108. What is an IC? State the advantages of Integrated Circuits over discrete
109. components.

Cognitive Level: APPLICATION

110. Distinguish between Intrinsic and Extrinsic semiconductors.
111. Explain P and N type semiconductors.
112. Explain the operation of PN junction Diode.
113. Explain the operation of Diode in no bias, forward and reverse bias conditions.
114. Explain the VI characteristics of Diode.
115. Explain with a neat sketch and waveforms the working of a full wave bridge
116. rectifier.
117. Explain the operation of NPN Transistor.
118. What is a BJT. List the applications of BJTs.
119. Explain with a neat circuit diagram the operation of Transistor as a Switch.
120. What is a SCR or Thyristor. Write the symbol. Also, list the industrial
121. applications of SCRs.
122. Explain with a simple diagram the operation of SCR.
123. What is a Timer. List the types.
124. Draw the logic symbol, write the truth table and Boolean expression for the following logic gates;
 - a) NOT
 - b) OR
 - c) AND
 - d) NAND
 - e) NOR
 - f) EX-OR.