ET-401E  Electrical Machine Design

L T P  Internal  :  30  Marks
3 1 0  External  :  70  Marks
                  Credit  3.5
                  DURATION OF EXAM:  3 HRS

UNIT I
GENERAL : General features & limitations of electrical machine design, types of enclosures, heat dissipation, temperature rise, heating & cooling cycles, rating of machines, cooling media used & effect of size and ventilation.
DC MACHINES : Output equation, choice of specific loadings, choice of poles and speed, Design of conductors, windings, slots field poles, field coils, commutator and machine design.

UNIT II
TRANSFORMERS: Standard specifications, output equations, design of core, coil, tank and Cooling tubes, calculation of circuit parameters, magnetizing current, losses and efficiency, Temperature rise and regulations from design data.
SYNCHRONOUS MACHINES: Specifications, ratings and dimensions, specific loadings, main dimensions, low speed machines, turbo generators, armature conductors, cooling.

UNIT III
INDUCTION MOTORS:
Three Phase Induction Motor: Standard specifications, output equations, specific loadings, main dimensions, conductor size and turns, no. of slots, slot design, stator core, rotor design, performance calculations.
Single Phase Induction Motor: output equations, specific loadings, main dimensions, design of main and auxiliary winding, capacitor design, equivalent circuit parameters, torque, efficiency.

UNIT IV
Computer Aided Design: Computerization of design procedures, development of computer programs & performance predictions, optimization techniques & their application to design problems.

TEXT BOOKS

REFERENCES
2. CG Veinott, Theory and design of small induction machines, MGH, 1959.
3. A Shanmugasundarem, Electrical machine design databook.

NOTE: The question paper shall have eight questions in all organized into four sections, each section having two questions from each of the four units. The candidate shall have to attempt five questions in all, selecting at least one question from each unit.
UNIT – 1:
Conduction & Breakdown in Gases, Liquid & Solid Dielectrics:
Liquid Dielectrics – Conduction & breakdown in pure & commercial liquids, suspended particle theory, stressed oil volume theory, liquid dielectrics used in practice.
Solid Dielectrics – Intrinsisc, electromechanical, & thermal breakdown, composit dielectric, solid dielectrics used in practice.

UNIT – 2:
Application of insulating materials in power transformers, rotating machines, circuit breakers, cables & power capacitors.
Generation of high D.C., A.C. impulse voltage & impulse currents. Tripping & control of impulse generators.
Measurement of high D.C., A.C. (Power frequency & high frequency) voltages, various types of potential dividers, generating voltmeter, peak reading A.C. voltmeter, Digital peak voltmeter, electrostatic voltmeter, Sphere gap method, factors influencing the spark voltage of sphere gaps.

UNIT – 3:
High Voltage Testing of Electrical Apparatus:
Testing of insulators, bushings, circuit breakers power capacitors & power transformers.
Over voltage Phenomenon & Insulation Co-ordination:
Theory of physics of lightning flashes & strokes. Insulation co-ordination, volt time and circuit time characteristics.
Boys camera, standard voltage & current shapes produced in Lab., Horn gap single diveters, ground wires, surge absorbers.

UNIT – 4:
EHV Transmission & Corona Loss:
Need for E.H.V. transmission, use of bundled conductors, corona characteristics of smooth bundled conductors with different configurations, corona loss, factors, affecting the corona.
Shunt & Series compensation of E.H.V. lines. Tuned power lines. & H.V.D.C. Transmission:
Advantages, disadvantages & economics of H.V.D.C. transmission system. Types of D.C. links, converter station equipment, their characteristics.

Suggested Books:
2. RS Jha, “HV Engg.”
5. Kimbark, “HVDC Transmission”. 

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UNIT-1 Sampling & Reconstruction: Time invariant vs. time variant systems. Introduction to discrete time system, Computer controlled system: Mathematical treatment of sampling process, Sampling theorem. Reconstruction from sampled signal, Transfer function of discrete data system: transfer function of discrete data system with cascade elements, transfer function of Z.O.H. Transfer function of closed loop discrete data system.


Stability Analysis:
Stability test of discrete data system: Jury's stability criterion, modified Routh's criterion, Schur Cohn criterion.

UNIT-3 Non-linear systems: Linear & non-linear systems classification & comparison, special features of non-linear systems, properties of non linear system. Linear verses Non-linear control system, different types of non-linearities Limit cycle, jump resonance, sub harmonics.


Books Recommended:
1. Control system by Ogata PHI Education.
2. Digital control system by M. Gopal TMH education...
3. Non Linear Control by Slotin & Li
4. Digital control and state variable by M. Gopal TMH education.
5. Modern Automatic control system by B.C. Kuo.

NOTE: The question paper shall have eight questions in all organized into four sections, each section having two questions from each of the four units. The candidate shall have to attempt five questions in all, selecting at least one question from each unit.
ET-419E Transducers And Their Applications

L T P Internal : 30 Marks
3 1 0 External : 70 Marks
Credit : 3.5
DURATION OF EXAM : 3 HRS

UNIT-I
Definition of transducer. Advantages of an electrical signal as output. Basic requirements of transducers, Primary and Secondary Transducer, Analog or digital types of transducers. Resistive, inductive, capacitive, piezoelectric, photoelectric and Hall effect transducers.

UNIT-II
Measurement of Displacement – Potentiometric resistance type transducers, inductive type transducers, differential transformer (L.V.D.T), capacitive transducers, Hall effect devices, strain gage transducers.
Measurement of Velocity – variable reluctance pick up, electromagnetic tachometers, photoelectric tachometer, toothed rotor tachometer generator.
Measurement of Flow: Venturi meter, orifice meter, nozzle meter, Pitot-static tube, rotameter, turbine flow meter, ultrasonic flow meter, electromagnetic flow meter, hot wire anemometer.

UNIT-III
Measurement of Pressure – Manometers, Force summing devices and electrical transducers
Measurement of Force – Strain-gage load cells, pneumatic load cell, LVDT type force transducer.
Measurement of Torque – Torque meter, torsion meter, absorption dynamometers, inductive torque transducer, digital methods

UNIT-IV
Measurement of Temperature – Metallic resistance thermometers, semi conductor resistance sensors (Thermistors), thermo-electric sensors, pyrometers.
Measurement of Liquid Level: Resistive Method, Inductive method, capacitive method
Sound Measurement: Microphone, Types of Microphones.
Measurement of Humidity: Resistive, capacitive, aluminium oxide & crystal hygrometers.

Suggested Books:


NOTE:
The question paper shall have eight questions in all organized into four sections, each section having two questions from each of the four units. The candidate shall have to attempt five questions in all, selecting at least one question from each unit.
ET-421E    Transducer Applications Lab

L    T    P
-    -    2

Internal : 30    Marks
External : 70    Marks
Credit    : 1
DURATION OF EXAM : 3 HRS

LIST OF EXPERIMENT

1. To Measure Temperature using RTD.
2. To Measure Displacement using L.V.D.T.
3. To Measure Load using Load Cell.
5. Light Measurement using LDR & Photo Cell.
6. To Measure Angular Displacement using Capacitive Transducer.
7. To Measure the Variation in Water Level using Capacitive Transducer.
8. To Measure Speed of DC Motor using Reluctance Method.
9. To Measure Strain using Strain Gauge.
10. To Measure Speed using Photo Interrupter Method.

NOTE: At least 7 experiments are to be performed from the above list, other than this, two more experiments are to be performed depending upon the scope.
LIST OF EXPERIMENTS:

1. To find out the dielectric strength of transformer oil.
2. To find zero sequence component of three phase line.
3. To draw the characteristics of thermal overload relay.
4. To study an IDMT over current relay to obtain and plot it’s characteristic curves i.e. the graph between current and time.
5. To measure the ABCD parameters of a given transmission line.
6. To plot the power angle characteristics of given transmission lines.
7. To find the string efficiency of a string insulator with/without guard rings.
8. To study the characteristics of transmission line for t-network & pie-network.
9. To study and testing of a current transformer.
10. To study various types of distance relay

**NOTE:** At least 7 experiments are to be performed from the above list, other than this, two more experiments are to be performed depending upon the scope.
List of Experiments

1. Design of Low pass filter with a Cut of frequency of 10 KHz and gain = 2
2. Design a Band Pass filter with lower cut of frequency = 1 KHz and upper cut of frequency of = 2KHz and gain = 2.
3. Design a high pass filter with cut of frequency = 10 KHZ and gain = 2
4. Design a positive and negative clipper using op amp 741
5. Design a positive and negative clamper using op amp 741.
6. Design a practical integrator with a frequency of 2 KHz
7. Design a practical differentiator with a frequency of 4 KHz.
8. Design a square wave generator with frequency of 2 KHz.
9. Design a Wein bridge oscillator with frequency of 1 MHz.
10. Design a phase shift oscillator with frequency of 1Khz.
11. To study RLC series resonance.
12. To study RLC parallel resonance.

**NOTE:** At least 7 experiments are to be performed from the above list, other than this, two more experiments are to be performed depending upon the scope.