Syllabus for written examination of TGT (Work Experience)

(Electrical Gadget and Electronics)

Unit: I

a. **CIRCUIT FUNDAMENTALS**

b. **RESISTIVE CIRCUITS**

c. **KIRCHHOFF'S LAW**

d. **NETWORK THEOREMS**

e. **PASSIVE CIRCUITS ELEMENTS**

f. **ENERGY SOURCES**

g. **MAGNETISM AND ELECTROMAGNETISM**

(a) Circuit Fundamentals

Zero Reference Level - Chassis Ground - Ohm's Law - Formula Variations of Ohm's Law - Graphical Representation of Ohm's Law - Linear Resistor - Non-linear Resistor - Cells in Series and Parallel - Conventional Problems

(b) Resistive Circuits

Series Circuit - Characteristics of a Series Circuit - The Case of Zero IR Drop - Polarity of IR Drops - Total Power - Series Aiding and Series Opposing Voltages - Proportional Voltage Formula in a Series Circuit Series Voltage Dividers - 'Opens' in a Series Circuit - 'Shorts' in a Series Circuit - Parallel Circuits - Laws of Parallel Circuits - Special Case of Equal Resistances in all Branches - Special Case of Only Two Branches Any Branch Resistance -Proportional Current Formula - 'Opens' in a Parallel Circuit - 'Shorts' in a Parallel Circuit - Series-Parallel Circuits Analysing Series Parallel Circuits - 'Opens' in Series-Parallel Circuits 'Shorts' in Series- Parallel Circuits - Voltage Division in a Complex Series-Parallel Circuit - Conventional Problems

(c) Kirchhoff's Laws

General - Kirchhoff's Current Law - Kirchhoff's Voltage Law - Determination of Algebraic Sign - Assumed Direction of Current Flow - Conventional Problems.

(d) Network Theorems

General - Superposition Theorem - Ideal Constant-Voltage Source - Ideal Constant-current Source - Thevenin's Theorem - How to Thevenize a Circuit? - Norton's Theorem - How to Nortonise a Given Circuit - Maximum Power Transfer Theorem - Conventional Problems

(e) Passive Circuit Elements

General - Resistors - Resistor Types - Wire-wound Resistors - Carbon Composition Resistors - Carbon Film Resistors - Cermet Film Resistors .Metal Film Resistors - Power Rating - Value Tolerance - Variable Resistors - Potentiometers and Rheostats - Fusible Resistors - Resistor Colour Code - Resistance Colour Bands - Resistors under Ten Ohm - Resistor Troubles - Checking Resistors with an Ohmmeter - Inductor - Comparison of Different Cores - Inductance of an Inductor - Another Definition of Inductance - Mutual Inductance - Coefficient of Coupling

- Variable Inductors - Inductors in Series or Parallel without M - Series Combination with M - Stray Inductance - Energy Inductance - Energy Stored in a Magnetic Field - DC Resistance of a Coil - Troubles in Coils - Reactance Offered by a Coil - Impedance Offered by a Coil - Q-Factor of a Coil - Capacitors - Capacitor Connected to a Battery - Capacitance -Factors Controlling Capacitance '- Types of Capacitors - Fixed Capacitors - Variable Capacitors - Voltage Rating of Capacitors - Stray Circuit Capacitance Leakage Resistance - Capacitors in Series - Two Capacitors in Series Capacitors in Parallel - Two Capacitors iri Parallel - Energy stored in a Capacitor - Troubles in Capacitors - Checking Capacitors with Ohmmeter - Charging of a Capacitor - Capacitor Connected Across an AC Source Capacitive Reactance

(f) Energy Sources

Primary and Secondary Cells - Cell and Battery - Voltage and Current of a Cells - Cell life - Different Types of Dry Cells - Carbon Zinc Cell Alkaline Cell - Manganese Alkaline Cell - Nickel Cadmium Cell - Mercury Cell - Silver Oxide Cell - Lead Cells - Battery Rating - Testing Dry Cells - Photoelectric Devices - Photovoltaic Cell - Solar Cell Conventional Problems

(g) Magnetism and Electromagnetism

Magnetic Materials- Ferrites - Types of Magnets - Demagnetising or Degaussing - Magnetic Shielding - Magnetic Terms and Units - Ohm's Law for Magnetic Circuit - Transformer - Transformer Working - Transformer Impedance - Can a Transformer Operate on DC ? - RF Shielding - Autotransformer - Impedance Matching - Conventional Problems.

Unit – II:

a)	A.C. FUNDAMEMTALS
b)	SERIES A.C. CIRCUITS
c)	TIME CONSTANTS
d)	TUNING CIRCUITS AND FILTERS
e)	SOLID STATE PHYSICS

f) THE P-N JUNCTION

g) P-N JUNCTION DIODE

(a) A.C. Fundamentals

Introduction – Types of Alternating Waveforms - The Basic AC Generator -Some Definitions - Characteristics of a Sine Wave - Audio and ,Radio Frequencies - Different Values of Sinusoidal Voltage and Current - Phase of an AC - Phase Difference - Vector Representation of an Alternating Quantity - AC Through Pure Resistance Only - AC Through Pure Inductance Only - AC Through Pure Capacitance Only - Non-sinusoidal Waveforms - Harmonics -Conventional Problems

(b)Series A.C. Circuits

R-L Circuit - Q Factor of a Coil - Skin Effect - R-C Circuit - Coupling Capacitor - R-L-C Circuit - Resonance in an R-L-C Circuit - Resonance Curve - Main Characteristics of Series Resonance - Bandwidth of a Tuned Circuit - Sharpness of Resonance - Tuning - Tuning Ratio - RaGio Tuning Dial - Parallel Resonance -Conventional Problem

(c) Time Constant

Rise and Fall of Current in Pure Resistance - Time Constant *at* an R-L Circuit - Circuit Conditions - Inductive Kick - Time Constant of an RC Circuit - Charging and Discharging of a Capacitor - Decreasing Time Constant - Flasher - Pulse Response of an RC Circuit - Effect of Long and Short Time Constants - Square Voltage Wave Applied to Short A. RC Circuit - Square Voltage Wave Applied to Long A,'E.C Circuit - Conventional Problems

(d) Timing Circuits and Filters

What-is. a Tuning Circuit ? - Tuned Circuit - Operating Characteristics of a Tuning Circuit - Resonance - Actual Series Resonance - Is it Series or Parallel Resonance ? - Tuned Transformers - Double Tuned Transformers - Parallel Circuit - Coupled Circuits - Simple Coupled Circuits - Coefficient of Coupling - Filters - Filter Definitions - Types of Filter Circuits - Low-pass Filter - Highpass Filter - Bandpass Filter - Bandstop Filter - Multisection Filter Circuits - Uses of Filters - Conventional Problems

(e) Solid State Physics

Definition of Matter - Crystalline Solids - Unit Cell - Forms of Matter - Atom and Molecule

- Atomic Structure - Atomic Number (Z) - Atomic Mass Number (A) - Electron Orbits or Shells - Electron Distribution of Different Atoms - Electron Sub orbits or Subshells - Valence Electrons Orbital Energy. - Normal, Excited and lonised Atom. - Orbital Energies in Hyrogen Atom - Energy Levels in an Isolated AtolW- Energy Bands in Solids - Bonds in Solids - Valence and Conduction Bands - Conduction in Solids - Hole Formation and its Movement - Conductors, Semiconductors and Insulators - Types of Semiconductors - Intrinsic Semiconductors Extrinsic Semicon'ductors - Majority and Minority Charge Carriers - Mobile Charge Carriers and Immobile Ions - Drift Current in Good Conductors Drift Current in Intrinsic Semiconductors - Intrinsic Conduction -Conventional Problems

(f) The P-N Junction

The P-N Junction - Formation of Depletion Layer - Junction or Barrier Voltage (V B) - Effect of Temperature on Barrier Voltage - Forward Biased P-N Junction - Forward VfI

Characteristics -Reverse Biased P-N Junction - Reverse Saturation Current (Is or 1_0) - Reverse V/ I Characteristic Combined Forward and Reverse VII Characteristics - Junction Breakdown - Junction Capacitance

(g) P-N Junction Diode

P-N Junction Diode - Diode Ratings or Specifications - Diode Testing The Ideal Diode - The Real Diode - Diode Circuits with DC and AC Voltage Sources - Diode Fabrication

- Grown Junction - Alloy Junction _ Diffused Junction - Epitaxial Junction - Point Contact Junction - Clippers and Clampers - Clippers - Some Clipping Circuits - Clampers -,- Summary of Clamping Circuits - Conventional Problems , Questions.

Unit – III

a)	**SPECIAL DIODE**
b)	**OPTOELECTRONIC DEVICES**
c)	**D.C POWER SUPPLIES**
d)	**THE BASIC TRANSISTOR**

e) TRANSISTOR CHARACTERISTICS AND APPROXIMATION

f) LOAD LINES AND DC BIAS CIRCUITS

g) TRANSISTOR EQUIBALENT CIRCUITS AND MODELS

(a) Special Diodes

Zener Diode - Voltage Regulation - Zener Diode as Peak Clipper - Meter Protection - Tunneling Effect - Tunnel Diode - Tunnel Diode OsciIator - Varactor - PIN Diode - Schottky Diode - Step Recovery Diode Thermistors -Conventional Problems

(b) Optoelectronic Devices

Introduction - Spectral Response of Human Eye - Light Emitting Diode (LED) - Photoemissive Devices - Photomultiplier Tube - Photovoltaic Devices - Bulk Type Photoconductive CelIs - Photodiodes -P-N Junction Photodiode - PIN Photodiode - Avalanche Photodiode -

(c) DC Power Supplies

Introduction - Unregulated Power Supply - Regulated Power Supply Steady and Pulsating DC Voltages - Rectifiers - Half-wave Rectifier FuIl-wave Rectifier - FuIl-wave Bridge Rectifier - Filters - Series Inductor Filter - Shunt Capacitor Filter - Effect of Increasing Filter Capacitance - LC Filter - The CLC or Pi Filter - Bleeder Resistor - Voltage Regulation Zener Diode Shunt Regulator - Transistor Series Voltage Regulator - ControIled Transistor Series Regulator - Transistor Shunt Voltage Regulator Transistor Current Regulator - Voltage Dividers - Complete Power Supply - Voltage Multipliers - Half-wave Voltage Doubler - FuIl-wave Voltage Doubler - Voltage Tripier and Quadrupler Circuits - Troubleshooting Power Supplies - ControIled Rectification - Output Waveforms for Different Firing Angles - Output Voltage and Current Values in ControIled Rectifiers Average Values for FW Controlled Rectifier - Silicon Controlled Rectifier (SCR) - Pulse Control of SCR - 90^0 Phas~ Control of SCR - 180^0 Phase Contr,gl of SCR - SCR Controlled Circuit - UJT ControIled Circuit Conventional Problems

(d) The Basic Transistor

The Bipolar Junction Transistor - Transistor Biasing -Important Biasing Rule - Transistor Currents - Summing Up - Transistor Circuit Configurations - CB Configuration - CE Configuration -Relations between α and β - CC Configuration - Relations between Transistor Currents - Leakage Currents in a Transistor - Thermal Runaway - Conventional Problems

(e) Transistor Characteristics and Approximations

Transistor Static Characteristics - Common Base Test Circuit - Common Base Static Characteristics – Common

Emitter Test Circuit - Common Emitter Static Characteristics - Common Collector Static Characteristics –

Different Ways of Drawing Transistor Circuits - Common Base Formulas Common Emitter Formulas –

Common Collector Formulas - The Beta Rule - Importance of V_{CE}- Cut-off and Saturation Points - Normal DC

Voltage Transistor Indications - Transistor Fault Location - Solving Universal Stabilization

Circuit

- Notation for Voltages and Currents - Increase / Decrease Notation - Applying AC to a DC Biased Transistor

- Transistor *AC/DC*

Analysis –Conventional problems

(f) Load Lines and DC Bias Circuits

DC Load Line - Q-point and Maximum Undistorted Output - Need for Biasing a Transistor - Factors Affecting

Bias Variations - Stability Factor - Beta Sensitivity - Stability Factor for CB and CE Circuits - Different

Methods for Transistor Biasing - Base Bias - Base Bias with Emitter Feedback - Base Bias with

Collector

Feedback - Base Bias with Collector and Emitter Feedbacks - Voltage Divider Bias - Load Line and Output

Characteristics - AC Lmid Line - Conventional Problems'

(g) Transistor Equivalent Circuits and Mode

General - DC Equivalent Circuit - AC Equivalent Circuit - Equivalent Circuit of a CB Amplifier - Effect of Source Resistance RS on Voltage Gain - Equivalent Circuit of a CE Amplifier - Effect of Source Resistance RS - Equivalent Circuit of a CC Amplifier - Small-Signal Low-frequency Model or Representation - General - T-Model - Formulas for T-Equivalent of a CB Circuit - T-Equivalent of a CE Circuit - T-Equivalent of a CC Circuit - What are h-parameters ? - The h-parameter Formulas for Notation for Transistors - The h-parameters of an Ideal Transistor -, The h-parameters of an Ideal CB Transistor - The h-parameters of an Id~al CE Transistor - Approximate Hybrid Equivalent Circuits - Typical Values of Transistor h-parameters - Hybrid Formulas for Transistor Amplifier - Approximate Hybrid Formulas -Conventional Problems

Unit – IV

a)	**SINGLE STAGE TRANSISTOR AMPLIFIER**
b)	**MULTISTAGE AMPLIFIER**
c)	**DECIBELS AND FREQUENCY RESPONSE**
d)	**FEEDBACK AMPLIFIERS**
e)	**FIELD EFFECT TRANSISTORS**
f)	**BREAKDOWN DEVICES**
g)	**SINUSOIDAL OSCILLATORS**
h)	**NON SINUSOIDAL OSCILLATORS**

(a) Single-Stage Transistor Amplifiers

Classification of Amplifiers - Common Base (CB) Amplifier - Various Gains of a CB Amplifier - Characteristics of a CB Amplifier - Common Emitter (CE) Amplifier - Various Gains of a CE

Amplifier - Characteristics of a CE Amplifier - Common Collector (CC) Amplifier - Various Gains of a CC Amplifier - Characteristics of a CC Amplifier - Uses - Comparison of Amplifier Configurations - Amplifier Classification Based on Biasing Condition - Graphic Representation - Class-A Amplifiers - Power Distribution in a Class-A Amplifier - Power Rectangle - Power Efficiency Maximum AC Power in Load - Transformer-coupled Class-A Amplifier Class-B Amplifier - Power Relations for Class-B Operation - Maximum Values - Class-B Push-Pull Amplifier - Crossover Distortion - Power Efficiency of Push-Pull Amplifiers - Complementary

Symmetry Push-Pull Class-B Amplifier - Class-C Amplifier - Tuned Amplifier - Distortion in

Amplifier - Non-linear Distortion - Intermodulation Distortion - Frequency Distortion - Phase or

Delay Distortion - Noise

(b) Multistage Amplifiers

General '--- Amplifier Coupling - RC-coupled Two-stage Amplifier - Advantages of RC Coupling

~ Impedance-coupled Two-stage Amplifier -Advantages of Impedance Coupling - .Transformer-coupled Two Stage Amplifier - Advantages of Transformer Coupling - Frequency Response - Applications - Direct-coupled Two-stage Amplifier Using Similar Transistors - Direct-coupled Amplifier Using Complementary Symmetry of Two Transistors - Darlington Pair - Advantages of Darlington Pair - Comparison between Darlington Pair and Emitter Follower - Special Features of· a Differential Amplifier - Common Model Input - Differential Amplifier -Conventional Problems

(c) Decibels and Frequency Response

The Decibel System - Other Expressions for Power Gain - Voltage and Current Levels - Characteristics of the Decibel System - Value of 1 dB Zero Decibel Reference Level - Variations in Amplifier Gain with Frequency - Changes in Voltage and Power Levels - Causes of Gain Variations Miller Effect - Cut-off Frequencies of Cascaded Amplifiers - Transistor Cut-off Frequencies - Alpha Cut-off Frequency - Beta Cut-off Frequency - The f_t of a Transistor - Relation Between f_{α}, f_{β} and f_T - Gain-Bandwidth Product - Conventional Problems

(d) Feedback Amplifier

Feedback Amplifiers - Principle of Feedback Amplifiers - Advantages of Negative Feedback - Gain Stability - Decreased Distortion - Increased Bandwidth - Forms of Negative Feedback - Shunt-derived Series-fed Voltage Feedback - Current-series Feedback Amplifier - Voltage-shunt Negative Feedback Amplifier - Current-shunt Negative Feedback Amplifier - Conventional Problems

(e) Field Effect Transistor

What is a FET ? - Junction FET (JFET) - Static Characteristics of a JFET - JFET Drain Characteristic with $V_{GS} = 0$ - JFET Characteristic with External Bias - Transfer Characteristic - Small Signal JFET Parameters DC Biasing of a JFET - DC Load Line - Common Source JFET

Amplifier - JEFT on an IC Chip - Advantages of FETs - MOSFET or IGFET DE MOSFET - Schematic Symbols for a DE MOSFET - Static Characteristics of a DE MOSFET - Enhancement-only N-channel MOSFET Transfer Characteristic - FETs as Switches - FET Applications - MOS-FET Handling

(f) Breakdown Devices

What are Breakdown Devices ? - Unijunction Transistor - UJT Relaxation Oscillator - Silicon Controlled Rectifier - 90° Phase Control - Theft Alarm - Triac -Diac - Silicon Controlled Switch (SCS) -

(g) Sinusoidal Oscillators

What is an Oscillator? - Comparison between an Amplifier and an Oscillator - Classification of Oscillators - Damped and Undamped Oscillations - The Oscillatory Circuit - Frequency of Oscillatory Current - Frequency Stability of an Oscillator - Essentials of a Feedback LC Oscillator - Tuned Base Oscillator - Tuned Collector Oscillator - Tuned Drain Oscillator (FET) - Hartley Oscillator - FET Hartley Oscillator - Colpitts Oscillator - Clapp Oscillator - FETCo]pitts Oscillator - Crystals - Crystal Controlled Oscillator - Transistor Pierce Crystal Oscillator - FET Pierce Oscillator - Phase Shift Principle - Phase Shift Oscillator - Wien Bridge Oscillator

(h) Noninusoidal Oscillators

Nonsinusoidal Waveforms -Classification of Nonsinusoidal Oscillators Pulse Definitions - Basic Requirements of a Sawtooth Generator -UJT Sawtooth Generator - Multivibrators (MV) - Uses of Multivibrators - Astable Multivibrator - Monostable Multivibrator (MMV) - Bistable Multivibrator (BMV) - Schmitt Trigger -Transistor Blocking Oscillator

Unit – V

a) MODULATION AND DEMODULATION

b) INTEGRATED CIRCUITS

c)	**~~NUMBER SYSTEMS~~**
d)	**LOGIC GATES**
e)	**BOOLEAN ALGEBRA**
f)	**LOGIC FAMILIES**
g)	**~~TRANSDUCERS~~**

h) ELECTRONIC INSTRUMENTS

(a) Modulation and Demodulation

Introduction - What is a Carrier Wave? - Radio Frequency Spectrum Sound - Need for Modulation - Radio Broadcasting - Modulation Methods of Modulation - Amplitude Modulation - Per cent Modulation Upper and Lower Side Frequencies - Upper and Lower Sidebands - Mathe-matical Analysis of a Modulated Carrier Wave - Power Relations in an AM Wave - Forms of Amplitude Modulation – Generation of SSB - Methods of Amplitude Modulation - Block Diagram of an AM Transmitter - Modulating Amplifier Circuit - Frequency Modulation - Frequency Deviation and Carrier Swing - Modulation Index'-Deviation Ratio - Per cent Modulation - FM Sidebands ;- Modulation Index and Number of Sidebands - Mathematical Expression for FM Wave - Demodulation or Detection - Essentials of AM Detection - Diode Detector for AM Signals - Transistor Detectors for AM Signals - FM Detection - Quadrature Detector - Frequency Conversion - Superheterodyne AM Receiver - FM Receiver - Comparison between AM and FM - The Four Fields of FM - Conventional Problems

(b) Integrated Circuits

Introduction - What is an Integrated Circuit? - Advantages of ICs - Drawbacks of ICs - Scale of

Integration - Classification of ICs by Structure Comparison between Different ICs - Classification of ICs by Function Linear Integrated Circuits (UCs) - Digital Integrated Circuits - IC Terminology - How Monolithic ICs are Made? - Ie Symbols - Fabrication of IC Components - Complete Monolithic Integrated Circuits - Popular Applications of ICs - MOS Integrated Circuits

- What is an OP-AMP ? OP-AMP Symbol - Polarity Conventions - Ideal Operational Amplifier - Virtual Ground and Summing Point - Why Vi is Reduced to almost Zero ? - OP-AMP Applications

- Linear Amplifier - Unity Follower - Adder or Summer - Subtractor - Integrator - Differentiator

– Comparator

(c) Number Systems

Number of Systems -The Decimal Number System - !3inary System Binary to Decimal Conversion - Binary Fractions - Double-Dadd Method - Decimal to Binary Conversion - Shifting the Place Point - Binary Operations - Binary Addition - Binary Subtraction - Complement of a Number - 1 's Complemental Subtraction - 2's Complemental Subtraction - Binary Multiplication - Binary Division - Shifting a Number to Left or Right - Representation of Binary Numbers as Electrical Signals - Octal Number System - Octal to Decimal Conversion -

Decimal to Octal Conversion - Binary to Octal Conversion -Octal to Binary Conversion - Advantages of Octal Number System - Hexadecimal Number System - How to Count beyond F in Hex Number System? ---, Binary to Hexadecimal Conversion - Hexadecimal to Binary Conversion -Conventional Problems

(d) Logic Gates

Definition - Positive and Negative Logic - The OR Gate - Equivalent Relay Circuit of an OR Gate

- Diode OR Gate - Transistor OR Gate OR Gate Symbolizes Logic Addition - Three Input OR Gate - Exclusive OR Gate - The AND Gate - Equivalent Relay Circuit of an AND Gate. Diode AND Gate ~ Transistor AND Circuit - AND Gate Symbolizes Logic Multiplication - The NOT Gate

- Equivalent Circuits for a NOT Gate The NOT Operation - Bubbled Gates -. The NOR Gate -

NOR Gate is a Universal Gate - The NAND Gate - NAND Gate is a Universal Gate The XNOR Gate - Logic Gates at a Glance - Adders and Subtractors Half Adder - Full Adder - Parallel Binary Adder -Half Subtractor - Full Subtractor -Conventional Problems

(e) Boolean Algebra

Introduction - Unique Feature of Boolean Algebra - Laws of Boolean Algebra - Equivalent

Switching Circuits - De Morgan's Theorems - Duals - Conventional Problems

(f) Logic Families

Main Logic Families - Saturated and Non-saturated Logic Circuits - Characteristics of Logic Families - RTL Circuit - DTL Circuit ---'- TTL Circuits - TTL Subfamilies -ECL Circuit $-I^2L$ Circuit - MOS Family - PMOS Circuit - NMOS Circuit - CMOS Circuit

(g) Transducer

What is a Transducer? - Classification of Transducers - Classification based on Electrical Principle Involved - Resistive Position Transducer - Resistive Pressure Transducer ---:- I~ductive Pressure Transducer - Capacitive Pressure Transducer - Self-generating Inductive Transducers - Linear Variable Differential Transformer (LVDT) - Piezoelectric Transducer - Strain Gauge Temperature Transducers - Resistance Temperature Detectors - Thermistor - Thermocouples - Ultrasonic Temperature Transducers - Photoelectric Transducers - Various Types of Microphones - Carbon Microphone Ribbon Microphone - Moving-Coil (Me) Microphone

- Crystal Microphone - Ceramic Microphone - Capacitor Microphone - The Electret Microphone

- The Loudspeaker

(h) Electronic Instruments

Introduction - Analog and Digital Instruments - Functions of Instruments - Electronic versus Electrical Instruments - Essentials of an Electronic Instrument - Measurement Standards - The Basic Meter Movement - Characteristics of Moving Coil Meter Movement - Variations of Basic Meter Movement - Converting Basic Meter to DC Ammeter - Multirange Meter - Measurement of Current - Converting Basic Meter to DC Voltmeter Multirange DC Voltmeter -Loading Effect of a Voltmeter - Ohmmeter The Multimeter - Rectifier Type AC Meter - Electronic Voltmeters - The Direct Current VTVM - Comparison of VOM and VTVM - Direct Current FET VM - Electronic Voltmeter for Alternating Currents - The Digital Voltmeter (DVM) -Cathode Ray Oscilloscope (CRO) - Cathode Ray Tube (CRT) - Deflection Sensitivity of a CRT - Normal Operation of a CRO Triggered and Non-triggered Scopes - Dual Trace CRO - Dual Beam CRO - Storage Oscilloscope - Sampling CRO - Digital Readout CRO - Lissajous Figures - Frequency Determination with Lissajous Figures - Applications of a CRO