WPCE LAB

SL.NO.	DEPT.	NAME OF LABORATO RY	NAME OF EQUIPEMENT	EXPERIMENTAL SETUP
01	ETC ENGG.	WPCE LAB	MICROWAVE TEST BENCH(KLYSTR ON POWER SUPPLY VSWR METER)	WORKING :- The reflex klystron makes use of velocity modulation to transform a continuous electron beam into microwave power. Electrons emitted from the cathode are accelerated and passed through the positive resonator towards negative reflector, which retards and finally reflects the electrons towards the resonator. The accelerated electrons have the resonator with increased velocity and the retarded electrons leave at reduced velocity. As the electrons bunch pass through resonator, they interact with voltage at resonator grids. If the bunches pass the grid, at such time, that the 3 electrons are slowed down by the voltage, energy will be delivered to the resonator and the klystron will oscillate. CONSTRUCTION:- Connect the components and equipments as shown. ii. Set the variable attenuator at minimum position. iii. Switch 'ON' the power supply, VSWR meter and cooling fan. iv. Put 'ON' the beam voltage switch and rotate the beam voltage knob clockwise in supply slowly and watch VSWR meter set the voltage for maximum deflection on the meter. v. Change the repeller voltage slowly & watch the VSWR meter. Set the voltage for maximum deflection on the meter. vi. Rotate the knob of frequency meter slowly and stop at that position where there is lowest O/P on VSWR meter. vii. Read directly, the frequency meter between two horizontal fine marks. viii. Change the repeller voltage and read the power and frequency for each repeller voltage.

ACE LAB

SL. NO .	DEPT.	NAME OF LABORATO RY	NAME OF EQUIPEMEN T	EXPERIMENTAL SETUP
01	ETC ENGG .	ACE LAB	OPTICAL FIBER LINK TRAINER KIT	WORKING :- . The Fiber Optic Analog Link consists of a transmitter which converts an electrical signal to a light signal, an optical fiber to guide the light and a receiver which detects the light signal and converts it to an electrical signal. Light sources are either light emitting diodes (LED's) or laser diodes and detectors are phototransistors or Photodiodes CONSTRUCTION:- Connect +15V adapter to both transmitter and receiver module.

				Switch (sw1) ON the transmitter Module and CRO. Connect the CRO Probe, positive to P1 and negative to P7 Ground. Now check the sine wave output on CRO and vary the Frequency and Amplitude pot meter min to max range.

ADC LAB

SL. NO.	DEPT.	NAME OF LABORATORY	NAME OF EQUIPEMENT	EXPERIMENTAL SETUP
01	ETC ENGG.	ADC LAB	AM MODULATOR AND DEMODULATOR	<u>WORKING :-</u> Amplitude modulation is defined as the process in which the amplitude of the carrier wave c(t) is varied about a mean value, linearly with the baseband signal. An AM wave may thus be dscribed, in the most general form, as a function of time as follows. S(t)=Ac{1+Kam(t)}cos(2πfct) Where Ka- Amplitude sensitivity of the modulator S(t) – Modulated signal Ac- carrier signal m(t) – modulating signal The amplitude of Ka m(t) is always less than unity, that is Ka m(t) 1 for any carrier wave becomes over modulated ,resulting in carrier phase reversal whenever the factor 1+Kam(t) crosses zero. The modulate wave then exhibits envelope distortion. The absolute maximum value of Ka m(t) multiplied by 100 is referred to as the percentage modulation. Vmax-Vmin Or percentage modulation = -------------- ×100 Vmax +Vmin <u>CONSTRUCTION:-</u> 1. Switch on the trainer kit and check the O/P of the carrier generator on oscilloscope. 2. Connect around 1KHz with 2Volts .A.F signal at A.F I/P to the modulator circuit. 3. Connect the carrier signal at carrier I/P of the modulator circuit. 4. Observe the

<table>
<tr><td></td><td></td><td></td><td></td><td>modulator output signal at AM O/p Spring by making necessary changes in A.F signal 5. Vary the modulating frequency and amplitude and observe the effects on the modulated waveform. 6. The depth of modulation can be varied using the variable knob provided at A.F input. 7. The percentage modulation can be calculated using the formula. Vmax-Vmin Percentage modulation = ---------------- × 100 Vmax +Vmin Vmax-Vmin Modulation factor = ---------------- Vmax +Vmin 8. Connect the output of the modulator to the input of the demodulator circuit and observe the output.</td></tr>
<tr><td></td><td></td><td></td><td>FM MODULATOR AND DEMODULATOR</td><td><u>WORKING :-</u> Consider a carrier signal, S(t) = A cos (ω c t + θ) (6.1) where A, ϖc, and θ denote the amplitude, frequency, and phase of the carrier signal respectively. Now consider a situation where the frequency of this signal changes in accordance with a modulating signal, f(t). The resulting signal can be expressed as S t A t A tk f d FM FM c f t ( ) cos[( )] cos ( ) = =+ + □ □ □ □ □ □ ∫ φ ω ττθ 0 (6.2) where the instantaneous frequency (in radians per second) of the signal is d t dt kft FM c f φ ω ( ) = + ( ) . Observe that the frequency of this signal is directly proportional to the modulating signal. Also, kf denotes a scaling factor, limiting the maximum frequency deviation of signal Δω, Δω = kf |f(t)|max (6.3) Because FM is a nonlinear modulation it is highly sensitive to the frequency content of modulating signal. To see this, start with a sinusoidal modulating signal.
here are two predominant methods for demodulating an FM signal. One is direct method that uses a linear frequency-to-voltage transfer characteristic. Such a system is called a frequency discriminator. The simplest discriminator is a differentiator. Table 1 Modulation index β Δω kf 0.01 1.0 2.4 10.0 50.0 Table 2 Amplitude of modulating signal, A Δω Modulation index β 1 volt 2 4 2.4 Page 5 of 9 Revision C The second method, considered an indirect method, uses a Phase-Locked Loop. In this procedure, a direct method is simulated, using a frequency differentiator and an envelope detector. 1) Generate the plots for modeling the demodulation. The FM signal is generated and demodulated in the m-file, pre6_4. The carrier is a sinusoid with 1 Vpp amplitude and 1 MHz. Modulating signal is a sinusoid with a 10 Vpp and 10 kHz. Try using different values for β to see the impact on the displayed spectra. To see what your FM radio receives, try using values such as are used for Commercial FM transmission (88 - 108 MHz).
<u>CONSTRUCTION:-</u> In this section the spectra of</td></tr>
</table>

				the signals of Prelab part 2 will be observed using FM signals produced by the function generator, and captured using TIMEFREQ.vi. Notice that since the frequency of an FM signal is time variant, not all the frequencies will be present in the particular interval of the signal recorded by TIMEFREQ.vi. You may expect to observe that some of the sidebands will not appear in the spectrum shown by the VI. EE3150 E. Cura 3 1. Connect the top signal generator (FG1) to the oscilloscope probe of Channel 1. In the FG1, set Amplitude A=10 V, Frequency fc=2kHz (this is the carrier frequency). Output an FM signal by pressing Shift FM . Set the frequency of the message signal (which is a sine wave) to fx=500 Hz by pressing Shift Freq , and the peak frequency deviation to Δf=50 Hz by pressing Shift Level Capture this signal and its spectrum using TIMEFREQ.vi and the parameters Channel=1, Time Span TS=5m, Freq. Span FS=10, a proper file name. [P1, 5 points]. 2. Repeat the previous step changing the values of fc, Δf, TS, and FS as follows: (a) fc = 2.5 kHz, Δf = 500 Hz, TS=5m, FS=20. [P2, 5]. (b) fc = 4.0 kHz, Δf = 1.2 kHz, TS=2m, FS=20. [P3, 5]. (c) fc = 5.0 kHz, Δf = 2.5 kHz, TS=2m, FS=20. [P4, 5].
			ASK MODULATOR AND DEMODULATOR	**WORKING:-** The block diagram of the ASK modulator is shown in fig 2.3. The sine carrier (1200 or 1800 Hz) is applied to an input of the balanced modulator 1; a data signal (indicated with I) is connected to the other circuit. The circuit usually carries out the balanced modulator function, and multiplies the two signals applied across the inputs. Unbalancing, though, the circuit with switch SW6 (in position ASK/FSK), it operates as amplitude modulator generating in this way the ASK signal of fig 2.1. The last, then, enters the adder used for FSK/QPSK/QAM modulations, and exits via a separator stage. The 6dB attenuator cuts the signal amplitude into half, and is activated only with the QAM. To block the operation of the balanced modulator 2 in ASK mode, the data input of the same modulator must be set on ASK (J3=d). The ASK demodulator consists of the sections represented in fig 2.4: ▪ a full wave envelope detector (ASK DEM) ▪ a low pass filter ▪ a threshold circuit (with output across TP29) in case of asynchronous data, which are not re-timed ▪ a clock extraction and data re-timing circuit, in case of synchronous data (data output on TP31, clock on TP32). The filter, the clock extraction circuit and the data re-timing one are used to demodulate also other kind of signals. **CONSTRUCTION:-** Power the module ▪ set the circuit in ASK mode, with 24-bit data source and

				without data coding (connect J1c-J3d-J4- J5-J6a; set SW2=Normal, SW3=24_bit, SW4=1200, SW6=ASK, SW8=BIT, ATT=min, NOISE=min) ▪ set an alternated data sequence 00/11 and push START ▪ connect the oscilloscope to TP6 and TP16 to display the data signal and the ASK signal. ▪ adjust the phase of the carrier (PHASE) to make the zero of the sine wave correspond to the starting of the bit intervals ▪ use the 1800Hz frequency as carrier (set SW4=1800). Keep the last conditions (J1c-J3d-J4-J5-J6a; SW2=Normal, SW3=24_bit, SW4=1200, SW6=ASK, SW8=BIT, ATT=min, NOISE=min) set an alternated data sequence 00/11 and push START• connect the oscilloscope to TP16 and TP20, to examine the ASK signal before and after the• communication channel note the effect of the communication channel on the ASK signal. As the communication channel• is limited band (the frequency response if low pass), the ASK output signal is slightly beveled. The effect is the more evident if a 1800-Hz carrier is used (switch SW4). Take SW4 to the position 1200 again.
			DELTA MODULATOR AND DEMODULATOR	<u>WORKING:-</u> Delta modulation process compares the present sample value to the previous sample value. Based upon the difference amplitude is going to be increased or decreased by step signal. If the amplitude is increased then step size increased by one step i.e., +Δ and bit 1 are generated. If the amplitude is decreased then step size is reduced by one step i.e., -Δ and bit 0 is generated. <u>CONSTRUCTION:-</u> T1 obtain and examine a DELTA MODULATOR UTILITIES module. Read about it in the TIMS Advanced Modules User Manual. Before plugging it in set the on-board switches to give an intermediate INTEGRATOR time constant (say SW2A to ON, and SW2B to OFF). Start with no division of the 100 kHz sample clock (front panel toggle switch up to 'CLK'). T2 plug in the ADDER and DELTA MODULATION UTILITIES module. T3 use a sinewave to set both of the ADDER gains close to unity. Do not change these for the duration of the experiment. Delta modulation D1 - 127 T4 use a sinewave to set both of the BUFFER AMPLIFIER gains to about unity (they are connected in series to make a non-inverting amplifier). Either one or both of these will be varied to make adjustments to the step size during the course of the experiment. T5 patch up a model of Figure 1. This is shown in Figure 6. Use the 100 kHz TTL signal from the MASTER SIGNALS module as the clock for the SAMPLER, and the 2 kHz MESSAGE for the sinusoidal message to be sampled. The message (2.083 kHz) is a sub-

				multiple of the 100 kHz sample clock. This helps to obtain text-book like oscilloscope displays.
			SUPERHETERODYNE RADIO RECEIVER	**WORKING :-** A superheterodyne receiver, often shortened to superhet, is **a type of radio receiver that uses frequency mixing to convert a received signal to a fixed intermediate frequency (IF)** which can be more conveniently processed than the original carrier frequency. **CONSTRUCTION:-** he Trainer helps to studies Gain selectivity Sensitivity of a Radio receiver Study of different functional block and its Signals i.e RF, AF, IF Amplifier The Trainer complete with AM transmitter, RF, MIXER, IF Amplifier, detector AF power amplifier & speakers, built in power supply etc. The kit complete with Pine wooden box, complete operating manual and patch cords. The Trainer helps to studies,

DE LAB				
SL. NO.	**DEPT.**	**NAME OF LABORATORY**	**NAME OF EQUIPEMENT**	**EXPERIMENTAL SETUP**
01	**ETC ENGG.**	**DE LAB**	**Basic gate trainer kit**	**WORKING :-** The logic gate works on the principle of **discrete connection of non-linear devices.** For example, the combination of transistors is connected to form the logic gates. There are seven basic logic gates: **AND, OR, XOR, NOT, NAND, NOR, and XNOR**. The AND gate is so named because, if 0 is called "false" and 1 is called "true," the gate acts in the same way as the logical "and" operator.

				CONSTRUCTION:- 1 Connect the trainer kit to ac power supply. 2 Construct gates by connecting the probes as per logic diagram. 3 Connect logic sources to the inputs and outputs Q, to logic indicators. 4 Apply various input combinations and observe Q, outputs. 5 Verify the truth table. 6 Switch off the ac power supply.
			Universal gate trainer kit	**WORKING :-** A universal gate is **a gate which can implement any Boolean function without need to use any other gate type**. The NAND and NOR gates are universal gates. In practice, this is advantageous since NAND and NOR gates are economical and easier to fabricate and are the basic gates used in all IC digital logic families. **CONSTRUCTION:-** 1 Connect the trainer kit to ac power supply. 2 Construct basic gates by connecting the probes as per logic diagram. 3 Connect logic sources to the inputs and outputs Q, to logic indicators. .4 Apply various input combinations and observe Q, outputs. .5 Verify the truth table. .6 Switch off the ac power supply.
			Adder trainer kit	**WORKING :-** Half Adder is combinational logic circuit which adds two 1-bit digits. The half adder produces a sum of the two inputs. Full adder is combinational logical circuit that performs an addition operation on three one-bit binary numbers. The full adder produces a sum of the three inputs and carry value. **CONSTRUCTION:-** .1 Connect the trainer kit to ac power supply. .2 Construct adder circuit by connecting the probes as per logic diagram. .3 Connect logic sources to the inputs and outputs Q, to logic indicators. .4 Apply various input combinations and observe Q, outputs. .5 Verify the truth table. .6 Switch off the ac power supply.
			Subtractor trainer kit	**WORKING :-** Subtractor circuits **take two binary numbers as input and subtract one binary number input from the other binary number input**. Similar to adders, it gives out two outputs, difference and borrow (carry-in the case of Adder).

				CONSTRUCTION:- .1 Connect the trainer kit to ac power supply. .2 Construct subtractor circuit by connecting the probes as per logic diagram. .3 Connect logic sources to the inputs and outputs Q, to logic indicators. .4 Apply various input combinations and observe Q, outputs. .5 Verify the truth table. .6 Switch off the ac power supply .
			Binary to Gray code converter trainer kit	**WORKING :-** The logical circuit which converts the binary code to equivalent gray code is known as **binary to gray code converter**. An n-bit gray code can be obtained by reflecting an n-1 bit code about an axis after 2^{n-1} rows and putting the MSB (Most Significant Bit) of 0 above the axis and the MSB of 1 below the axis. **CONSTRUCTION:-** .1 Connect the trainer kit to ac power supply. .2 Construct gray code converter by connecting the probes to the XOR gates as per logic diagram. .3 Connect logic sources to the inputs and outputs Q, to logic indicators. .4 Apply various input combinations and observe Q, outputs. .5 Verify the truth table. .6 Switch off the ac power supply
			Comparator trainer kit	**WORKING :-** A Digital Comparator is **a combinational logic circuit that is used for comparison of two binary values**. Basically it generates the desired signal (either low or high) at the output when compares two digital values provided at its input. **CONSTRUCTION:-** .1 Connect the trainer kit to ac power supply. .2 Construct comparator by connecting the probes as per logic diagram. .3 Connect logic sources to the inputs and outputs Q, to logic indicators. .4 Apply various input combinations and observe Q, outputs. .5 Verify the truth table. .6 Switch off the ac power supply
			MUX &	**WORKING :-**

			DEMUX trainer kit	The multiplexer works like a multiple-input and single-output switch. **The output gets connected to only one of the n data inputs at a given instant of time**. Therefore, the multiplexer is 'many into one' and it works as the digital equivalent of an analog selector switch. **A Demultiplexer functions exactly in the reverse way of a multiplexer** i.e., a demultiplexer accepts only one input and gives many outputs. **CONSTRUCTION:-** .1 Connect the trainer kit to ac power supply. .2 Construct MUX & DEMUX by connecting the probes as per logic diagram. .3 Connect logic sources to the inputs and outputs Q, to logic indicators. .4 Apply various input combinations and observe Q, outputs. .5 Verify the truth table.
			Flip Flop trainer kit	**WORKING :-** A flip-flop is a device which **stores a single bit (binary digit) of data; one of its two states represents a "one" and the other represents a "zero"**. Such data storage can be used for storage of state, and such a circuit is described as sequential logic in electronics. **CONSTRUCTION:-** .1 Connect the trainer kit to ac power supply. .2 Construct different fllip-flop by connecting the probes as per logic diagram. .3 Connect logic sources to the inputs and outputs Q, to logic indicators. .4 Apply various input combinations and observe Q, outputs. .5 Verify the truth table
			Counter trainer kit	**WORKING :-** An electronic counter is a sequential logic circuit which has a clock input signal and a group of output signals that represent an integer "counts" value. **Upon each qualified clock edge, the circuit will increment (or decrement, depending on circuit design) the counts**. **CONSTRUCTION:-** .1 Connect the trainer kit to ac power supply. .2 Construct different fllip-flop by connecting the probes as per logic diagram. .3 Connect logic sources to the inputs and outputs Q, to logic indicators. .4 Apply various input combinations and observe Q, outputs. .5 Verify the truth table.

DE & MP LAB

SL. NO.	DEPT.	NAME OF LABORATORY	NAME OF EQUIPEMENT	EXPERIMENTAL SETUP
01	ETC ENGG.	DE & MP LAB	Basic gate trainer kit	**WORKING :-** The logic gate works on the principle of **discrete connection of non-linear devices**. For example, the combination of transistors is connected to form the logic gates. There are seven basic logic gates: **AND, OR, XOR, NOT, NAND, NOR, and XNOR**. The AND gate is so named because, if 0 is called "false" and 1 is called "true," the gate acts in the same way as the logical "and" operator. **CONSTRUCTION:-** .1 Connect the trainer kit to ac power supply. .2 Construct gates by connecting the probes as per logic diagram. .3 Connect logic sources to the inputs and outputs Q, to logic indicators. .4 Apply various input combinations and observe Q, outputs. .5 Verify the truth table. .6 Switch off the ac power supply.
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			MUX & DEMUX trainer kit	**WORKING :-** The multiplexer works like a multiple-input and single-output switch. **The output gets connected to only one of the n data inputs at a given instant of time**. Therefore, the multiplexer is 'many into one' and it works as the digital equivalent of an analog selector switch. **A Demultiplexer functions exactly in the reverse way of a multiplexer** i.e., a demultiplexer accepts only one input and gives many outputs. **CONSTRUCTION:-** .1 Connect the trainer kit to ac power supply. .2 Construct MUX & DEMUX by connecting the probes as per logic diagram. .3 Connect logic sources to the inputs and outputs Q, to logic indicators. .4 Apply various input combinations and observe Q, outputs. .5 Verify the truth table.
			Flip Flop trainer kit	**WORKING :-** A flip-flop is a device which **stores a single bit (binary digit) of data; one of its two states represents a "one" and the other represents a "zero"**. Such data storage can be used for storage of state, and such a circuit is described as sequential logic in electronics. **CONSTRUCTION:-** .1 Connect the trainer kit to ac power supply. .2 Construct different fllip-flop by connecting the probes as per logic diagram. .3 Connect logic sources to the inputs and outputs Q, to logic indicators. .4 Apply various input combinations and observe Q, outputs. .5 Verify the truth table
			Counter trainer kit	**WORKING :-** An electronic counter is a sequential logic circuit which has a clock input signal and a group of output signals that represent an integer "counts" value. **Upon each qualified clock edge, the circuit will increment (or decrement,**

				depending on circuit design) the counts. **CONSTRUCTION:-** 1 Connect the trainer kit to ac power supply. 2 Construct different fllip-flop by connecting the probes as per logic diagram. 3 Connect logic sources to the inputs and outputs Q, to logic indicators. 4 Apply various input combinations and observe Q, outputs. 5 Verify the truth table.
			8085 MP trainer kit	**WORKING :-** A microprocessor **accepts binary data as input, processes that data, and then provides output based on the instructions stored in the memory**. The data is processed using the microprocessor's ALU (arithmetical and logical unit), control unit, and a register array. **CONSTRUCTION:-** 1 Connect the trainer kit to ac power supply. 2 Enter the program, the inputs variables and verify the output in the 7-segment display.

EMI LAB

SL. NO.	DEPT.	NAME OF LABORATORY	NAME OF EQUIPEMENT	EXPERIMENTAL SETUP
01	ETC ENGG.	EMI LAB	Function Generator & CRO	**WORKING :-** **CONSTRUCTION:-**
			Wheatstone Bridge trainer kit	**WORKING :-** **CONSTRUCTION:-**
			Maxwell bridge trainer kit	**WORKING :-** **CONSTRUCTION:-**
			Schering bridge trainer kit	**WORKING :-** **CONSTRUCTION:-**
			Hey's bridge trainer kit	**WORKING :-** **CONSTRUCTION:-**
			LCR Q-meter trainer kit	**WORKING :-** **CONSTRUCTION:-**

AE & LI LAB				
SL. NO.	DEPT.	NAME OF LABORATORY	NAME OF EQUIPEMENT	EXPERIMENTAL SETUP
01	ETC ENGG.	AE & LI LAB	Diode Char. Trainer kit	WORKING :- CONSTRUCTION:-
			Bridge rectifier trainer kit	WORKING :- CONSTRUCTION:-
			Transistor char. Trainer kit	WORKING :- CONSTRUCTION:-
			Voltage regulator using Zener diode kit	WORKING :- CONSTRUCTION:-
			RC coupled amplifier trainer kit	WORKING :- CONSTRUCTION:-
			Class A, B, C, Tuned & Push-Pull Amplifier trainer kit	WORKING :- CONSTRUCTION:-
			JFET & MOSFET trainer kit	WORKING :- CONSTRUCTION:-
			Hartly, Collpit's, Wein bridge, R-C phase shift oscillator trainer kit	WORKING :- CONSTRUCTION:-
			Multivibrator trainer kit	WORKING :- CONSTRUCTION:-

			741 OP-AMP trainer kit	**WORKING :-** **CONSTRUCTION:-**

MP & MC LAB				
SL. NO.	**DEPT.**	**NAME OF LABORATORY**	**NAME OF EQUIPEMENT**	**EXPERIMENTAL SETUP**
01	**ETC ENGG.**	**MP & MC LAB**	**8085 MP trainer kit**	**WORKING :-** **CONSTRUCTION:-**
			8086 MP trainer kit	**WORKING :-** **CONSTRUCTION:-**