



INSTRUCTIONS TO THE CANDIDATES

- ✿ Please choose one of the following research projects
- ✿ Notice carefully, we will not be able to accept any submitted research if it is proven to be quoted or transferred from other thesis or papers in whole or in part or it is merely a copy of what was stated in one of the articles, thesis or scientific references
- ✿ Notice carefully, we will not be able to accept any submitted research if it is proven to be quoted or transferred in whole or in part from any submitted research
- ✿ Your research should be written as attached template and every title should be covered.
- ✿ Your research project must be kept within 2500 words excluding cover and table of contents pages.
- ✿ Your research file must be in pdf format

RESEARCH PROJECT NO. ONE:

DESIGN OF A READ ONLY MEMORY WITH ISOLATED GATE TRANSISTORS

Based on your knowledge in the subjects of Digital Circuit design and Electronic Engineering courses discuss the design of ROM family based on Isolated Gate FET transistors. Your research project must cover at least the following:

1. List the types of ROM families;
2. Describe a basic isolated gate FET ROM storage cell;
3. Describe a basic PROM memory cell;
4. Discuss EPROMs including UV EPROMs and EEPROMs;
5. Discuss the basic characteristics of a flash memory;
6. Discuss the checksum method of testing ROMs;
7. Discuss some ROM applications;

RESEARCH PROJECT NO. TWO: NON-BINARY COUNTER

Counters can be designed to generate any desired sequence of states. The sequence may follow the binary count or may be any other arbitrary sequence. Counters are used to generate timing signals to control the sequence of operations in a digital system. Counters can also be constructed by means of shift registers. Your research project aims to describe the non-binary counters and you must cover at least the following:

1. Discuss the basic characteristics of Ring Counter
2. Discuss the basic characteristics of Johnson Counter
3. Discuss the basic characteristics of Switch tail ring counter
4. Write and verify the VHDL behavioral and structural descriptions of the four bit SISO shift register and 2- Bit counter.

RESEARCH PROJECT NO. THREE: THE 555 TIMER

The 555 timer is a versatile and widely used IC device because it can be configured in two different modes as a monostable multivibrator (one shot) or as an astable multivibrator (oscillator). An astable multivibrator has no stable states and therefore changes back and forth between two unstable states without any external triggering. Your discussion should cover at least the following:

1. Describe the basic elements in a 555 timer
2. Setup a 555 timer as a one-shot
3. Setup a 555 timer as an oscillator

RESEARCH PROJECT NO. FOUR: TROUBLESHOOTING

Troubleshooting is the process of recognizing, isolating, and correcting a fault or failure in a circuit or system. To be an effective troubleshooter, you must understand how the circuit or system is supposed to work and able to recognize incorrect performance. For example, to determine whether or not a certain gate is faulty, you must know what the output should be for the given inputs. Your research project aims to describe the troubleshoot tools to recognize internal failures of IC logic gates. Your discussion should cover at least the following:

1. List the most common types of failures in ICs;
2. Conditions for testing logic gates;
3. Effects of an internally open input in driving gate;
4. Effects of an internally open outputs in driving gate;
5. Troubleshooting an open inputs and outputs of IC logic gates;
6. Effects of a shorted IC input or output in driving gate;
7. Test the external faults on a board using signal tracing and waveform analysis.

RESEARCH PROJECT NO. FIVE: PROGRAMMABLE LOGIC DEVICES

Programmable logic device (PLD) is an integrated circuit with programmable gates divided into an AND array and an OR array to provide an AND–OR sum of product implementation. There are three major types of combinational PLDs, differing in the placement of the programmable connections in the AND–OR array. Your research project aims to describe the configuration of the three PLDs and you must cover at least the following:

1. Discuss the basic configuration of programmable logic array.
2. Discuss the basic configuration of programmable array logic.
3. Discuss the basic configuration of sequential programmable logic device (SPLD)
4. Discuss the basic configuration of complex programmable logic device (CPLD)
5. Discuss the basic configuration of field programmable gate array (FPGA)
6. Design of a selected combinational circuit with PAL and PLA should demonstrate.

RESEARCH PROJECT NO. SIX:

VHDL MODELS OF COMBINATIONAL CIRCUITS

Prototype integrated circuits are too expensive and time consuming to build, so all modern design tools rely on a hardware description language to describe, design, and test a circuit in software before it is ever manufactured. Depending on the HDL, the description can be in a variety of forms: Boolean logic equations, truth tables, a netlist of interconnected gates, or an abstract behavioral model. The HDL model may also represent a partition of a larger circuit into smaller interconnected and interacting functional units. Your research project aims to describe the following modeling styles:

1. Gate-level modeling using instantiations of predefined and user-defined primitive gates.
2. Dataflow modeling using continuous assignment statements with the keyword assign.
3. Behavioral modeling using procedural assignment statements with the keyword always.
4. Write the VHDL gate-level description of the priority encoder circuit.
5. Write the VHDL dataflow description of a 2-to-1-line multiplexer with enable.