TRF RECRUITMENT 2022

SYLLABUS STUDY, REFERENCES FOR MCQ TEST & INTERVIEWS

ELECTRONICS DOMAIN

For Second Year and Third Year Students

I. Basic Electronics

1. Concepts of Current, voltage, resistance, capacitance, and inductance.
2. Kirchhoff's Law, Ohm's Law
3. RLC Circuits

II. Analog electronics

1. Operational Amplifiers: Inverting amplifier, non-Inverting amplifier
2. Transformers
3. Diode, BJT (Transistor as a switch and amplifier, operating modes of a transistor), MOSFET, IGBT

III. Digital electronics

1. Number System Overview
2. Logic Gates: AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR, EX-OR.
3. Combinational Circuits: Half Adder, Full Adder, Half Subtractor, Full Subtractor
4. Sequential Circuits: synchronous and asynchronous circuits, S-R latch,

Flip-Flops R-S Flip-Flop, J-K Flip-Flop, D Flip-Flop, T Flip-Flop

5. Boolean algebra: Bitwise addition, subtraction, 1's complement, 2's complement, Bitwise AND, OR and EX-OR.

IV. Actuators

1. Motors: DC, BLDC, Stepper and servo motor, Induction motors, Torque-speed characteristics of motors, Concept of back emf, Motor Driver control (PWM).
2. Pneumatics Actuators.
3. Relays: Electromagnetic relays, Solid state relays, Hybrid relays.
4. Switches: SPST, SPDT, DPST, DPDT, Push Buttons, Toggle Switch.

V. Power Electronics

1. Power supply: AC to DC conversion, Regulated power supply, SMPS.
2. Voltage regulator, 78XX family.

VI. Battery

1. LiPo battery, LiFe battery, lead acid battery, etc.
2. Battery selection calculations.

VII. Embedded Systems

1. Microcontroller (8051, Atmaga328P): Basics of memory organization and addressing modes of Atmega328p, Microcontroller architecture, Pin Configuration, DAC, ADC, Timers, and counters and their applications, Different buses, Interrupts, PWM resolution.

VIII. Communication

1. Analog Communication, Digital Communication, Wireless Communication Basics, Communication Protocols (UART, I2C, USART, SPI).
2. Bluetooth protocol, Web socket protocol.

IX. Sensors

1. Ultrasonic sensor, IR sensor, Different temperature sensors, Proximity sensors, Rotary encoder, hall-effect sensor, Tactile sensor, current sensor, Image sensor.
2. Sensitivity, accuracy, resolution of sensors.

X. Programming

1. C Programming, Arduino Programming, Basics of Assembly Language Programming

For Third Year Students

I. Analog Electronics

1. Operational amplifier: Inverting Summing amplifier, Differential amplifier,
2. Integrator, Differentiator, Voltage follower.
3. Buck converter.

II. Digital Electronics

1. K-maps, MUX and DEMUX, Encoder and Decoder.
2. Debugging tools of circuits: JTAG, SWD.

III. Communication Protocols

1. RS232, RS485, Power over Ethernet (PoE).

IV. Control Systems

1. Open-loop and closed-loop systems, PID Control, Network Theorems, Single & Two-Port Networks, resolution.
2. Parallel processing

V. Programming

1. Sorting Techniques
    a. Bubble sort
    b. Insertion sort
    c. Selection sort
    d. Quick sort
    e. Merge sort
2. Searching techniques
    a. Linear search
    b. Binary search
3. Operations on stack and queue
4. Stack implementation using array
5. Queue implementation using array
6. Enqueue, Dequeue
7. Time complexity of algorithms
8. Basics of Object-oriented Programming (OOP's)
    I. Classes and objects.
    II. Constructor, destructor, and their types
    III. Pillars of object-oriented programming
        a. Inheritance
        b. Polymorphism
        c. Encapsulation
        d. Abstraction

REFERENCE FOR STUDY MATERIAL

I. Basic Electronic

1. Digital electronics- XI, XII, FUNDAMENTALS OF ELECTRONICS BY SUPEKAR.
2. Phadke prakashan electronics book for XI AND XII
3. https://www.tutorialspoint.com/basic_electronics/basic_electronics_types_of_transistors.htm

4. https://www.tutorialspoint.com/semiconductor_devices/semiconductor_dev ices_operational_amplifiers.htm

5. https://www.tutorialspoint.com/pulse_circuits/pulse_circuits_transistor_as_ switch.html