TEST NAME: 309 – ELECTRONICS

Section A

A.C. CIRCUIT FUNDAMENTALS

The sinusoidal voltage and current-Average and R.M.S values- phasor representation- j operator, polar and rectangular forms of complex numbers, A.C applied to RC, RL and RLC circuits – phasor diagrams-concept of impedance-power factor in a.c circuits, numerical problems.

PASSIVE NETWORKS

Concept of ideal as well as practical voltage and current sources, regulation Kirchhoff's current law – Kirchhoff's voltage law – Method of solving A.C and D.C circuits by Kirchhoff's laws Loop analysis- Nodal analysis – numerical problems.

NETWORK THEOREMS

Maximum power transfer theorem – super position theorem-the venin's theorem – norton's theorem – thevenising a circuit – Thevenin Norton conversion – Milliman theorem-Reciprocity theorem-problem solving applications for all the theorems.

RC AND RL CIRCUITS

Transient response of RL and RC circuits with step input, time constants, frequency response of RC and RL circuits, their action as low pass and high pass filters passive differentiating and integrating circuits, numerical problems.

RESONANCE IN ELECTRIC CIRCUITS

Resonance in series and parallel R – L – C circuits, Resonant frequency, Q-factor, Bandwidth, selectivity. Comparision of series and parallel resonance. Tank circuit-LC oscillations, numerical problems.

JUNCTION DIODES

PN junction diode – P-N junction theory-depletion region, barrier potential, working in forward& reverse bias condition, Junction capacitance, Diode current equation (no derivation), Effect of temperature on reverse saturation current, V-I Characteristics , Zener and Avalanche Break down, Zener diode - V-I characteristics, regulated power supply using Zener diode, Varactor Diode, Tunnel Diode – Principle, Working & Applications.

BIPOLAR JUNCTION TRANSISTORS (BJT)

PNP and NPN transistors, current components in BJT, BJT static characteristics (Input and Output), Early effect, CB, CE, CC Configurations (Cut-off, Active and saturation regions), h-parameters, h-parameter equivalent circuit. Determination of h-parameters from the characteristics, Concept of amplification-voltage and current amplifier. Biasing and load line analysis, Fixed bias, voltage divider bias arrangements, The CE amplifier-analysis and parameters, Transistor as a switch.

FIELD EFFECT TRANSISTORS & UJT

FET - Construction - Working – Drain & Transfer characteristics –Parameters of FET – FET as an amplifier-MOSFET-Enhancement, MOSFET –Depletion, MOSFET –Construction& Working- Drain characteristics of MOSFET –Comparison of FET & BJT and JFET & MOSFET. UJT Construction-working, V-I Characteristics

PHOTO ELECTRIC DEVICES

      Structure and operation, characteristics, spectral response and applications of LDR, Photo Voltaic cell, Photo diode, Photo transistor, LED and LCD

POWER SUPPLIES

      Rectifiers – Half wave, full wave and bridge rectifiers – Efficiency – Ripple factor – Regulation Types of filter- Choke input (Inductor) filter – shunt capacitor filter –L-Section and π section filters — Voltage regulators- Transistor Series and shunt regulators – Block diagram of regulated power supply, Three terminal fixed voltage I.C regulators (78XX and 79XX) - Principle and working of switch mode power supplies (SMPS).

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Section - B
Digital Electronics

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NUMBER SYSTEM AND CODES:

      Decimal, Binary, Hexadecimal, Octal, BCD, Conversions, Complements (1's, 2's,9's and 10's), Addition, Subtraction, Gray, Excess-3 Code conversion from one to another, ASCII code.

BOOLEAN ALGEBRA AND THEOREMS:

      Boolean Theorems, De-Morgan's laws. Digital logic gates, Multi level NAND & NOR gates. Standard representation of logic functions (SOP and POS), Minimization Techniques (Karnaugh Map Method: 4,5 variables), don't care condition.

COMBINATIONAL DIGITAL CIRCUITS:

      Adders-Half & full adder, Subtractor-Half and full subtractors, Parallel binary adder, Magnitude Comparator, Multiplexers (2:1,4:1,8:1) and Demultiplexers (1:2,1:4) Encoders (Octal to Binary, Decimal to BCD)- Decoder (Binary to Octal, BCD to Decimal), IC-LOGIC FAMILIES: TTL logic, DTL logic, RTL Logic, CMOS Logic families (NAND & NOR Gates), Bi-CMOS inverter

SEQUENTIAL DIGITAL CIRCUITS:

      Flip Flops: S-R FF , J-K FF, T and D type FFs, Master-Slave FFs, Excitation tables for JK and T FFs, Shift registers(SISO,SIPO,PISO,PIPO),-shift left register, shift right register, Counters - Asynchronous-Mod16, Mod-10, Down counter,Synchronous-4-bit counter & Ring counter.

MEMORY DEVICES:

      General Memory Operations, ROM, RAM (Static and Dynamic), PROM, EPROM, EEPROM, EAROM, PLA (Programmable logic Array), PAL (Programmable Array Logic. Architecture, combinational logic design using PLAs & PALs).

ANALOG AND DIGITAL IC-APPLICATION

OPERATIONAL AMPLIFIERS: Definition, Basic op-amp, Ideal op-amp, Block diagram of op-amp, inverting, noninverting, virtual ground, Adders, subtractors, summing amplifier, voltage follower, op-amp parameters, voltage to current convertor, integrator, differentiator, differential amplifier, Logarithmic amplifier.

OP-AMP CIRCUITS: Voltage regulator, comparator, zero cross detecting circuit, Instrumentational amplifier, multividrators-a stable, monostable, Bi-stable, Schmitt trigger, sine Wave generator, square wave generator, triangular wave generator, Active filters (Basics)-low Pass, high pass, band pass filters.

IC-555 – FUNCTIONAL BLOCK DIAGRAM AND IT'S APPLICATIONS
COMBINATIONAL & SEQUENTIAL LOGIC CIRCUITS (IC-Applications):
Design of Code convertor: BCD to Seven Segment, BCD to Grey, Grey to Binary.
Design of Counters using excitation tables: Mod-N counters (Asynchronous & synchronous), Pre-settable Binary Up/Down Counter, Design of Universal Shift Register.

DATA CONVERTERS:

D/A converter: Basic principles of DAC, R-2R Ladder network, Binary Weighted, pecifications of DAC.

A/D converter: Basic principles of ADC, Succeive Approximation ADC, Single slope and dual slope converter, Sigma-delta ADC, Specifications of ADC.

DIGITAL SYSTEM INTERFACING AND APPLICATIONS: Interfacing of LEDs, Applications of Counters: Digital Clock, Frequency counter.
Applications of Shift Registers: Parallel to Serial, Serial to Parallel, UART.

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