**BRANCH: ELECTRONICS**

ELECTRICAL CIRCUIT AND NETWORK

Code: EL-401 L-T-P: 3-0-3

Total marks: 100 Theory: 28/70 Sessional: 15/30 Hours

1. Fundamental Concept: Concept of current, voltage, resistance, capacitance, inductance and circuit parameters. 2
2. Circuit Theorem: Statement and applications of Ohm’s law, Kirchhoff’s law, Thevenin’s theorem, Norton’s theorem, Maximum power transfer theorem, Reciprocity theorem, superposition theorem, star-delta transformation. 9
3. Direct current circuit: Series, parallel, series-parallel circuit of resistance with problems. Division of current in parallel circuit and problems. 6
4. A C Series circuit: Alternating current fundamentals, equations of alternating voltages & currents, R-L, R-C, R-L-C series circuits, Resonance in R-L-C series circuits. Polar and Cartesian representation (J-operation). 7
5. A C Parallel circuit: Solving parallel circuit by vector methods, admittance method and complex algebra method. Resonance in parallel circuits. 7
6. Three phase circuits: Operational characteristics of 3-phase system, principle of 3-phase generation of power. Star-delta connection. Relations of current, voltage and power. 7
7. Transients: Fundamental concept of transients, Oscillating circuit, natural frequency, forced frequency. 4
8. Class Test. 3

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ELECTRICAL CIRCUIT & NETWORK LAB

Code: EL-401(P) Total Marks: 50

Practical: 12/25 Sessional: 13/25

1. Verification of Kirchhoff’s Law.
2. Verification of Superposition Theorem.
3. Verification of maximum power transfer Theorem.
4. Study of A C parallel circuit.
5. Study of resonance in A C series circuit.
6. Study of resonance in A C parallel circuit.
7. Measurement of single phase power and power factor.
8. Measurement of 3-phase power.

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ANALOG ELECTRONICS-II

Code: ET-405 L-T-P: 3-0-3

Total marks: 100 Theory: 2/70 Sessional: 15/30 Hours

1. **UNI-JUNCTION TRANSISTOR (UJT):** Construction, operation & characteristics of UJT. UJT relaxation oscillator – its operation & uses. 2

**2. FIELD EFFECT TRANSISTOR (FET**): Classification of FET: Construction, operation & characteristics of JFET & MOSFET. FET biasing techniques. Comparison of FET and BJT. 6

**3. DIFFERENTIAL AMPLIFIER:** Basic principles of differential amplifier – inverting & non-inverting input; single/ double ended input/output operation: difference and common mode gain: Common Mode Rejection Rate (CMRR). Circuit diagram of differential amplifier using BJT or FET, its operation. 5

**4. OPERATIONAL AMPLIFIER:** Differential Amplifier as its building block, other circuitry required, idea Op-Amp characteristics. Applications of Op-Amp-inverting amplifier, voltage follower, multiplier, summer, integrator, differentiator etc. The 741 Op-Amp IC-characteristics, pin-out diagram. 7

**5. DC VOLTAGE REGULATOR:** Transistorized linear regulator circuits – Series regulator, shunt regulator. IC Regulators. 4

**6. WAVE SHAPING CIRCUITS**: High-pass and Low-pass circuits – operation with different inputs, integrator, differentiator. Clipping and clamping circuits – their operations, clipping at different levels. 4

**7. PULSE CIRCUITS:** Concept of step pulse, rectangular pulse and their characteristics study. Concept of electronic switch – switching diode transistor as switch, their characteristics studies. Multivibrators – operation of Bi-stable, Schmitt Trigger, Mono-stable and A-stable multi-vibrators and their waveforms. 8

**8**. **SWEEP CIRCUIT:** Concept of sweep, difference between voltage and current time base generators. Operation of miller sweep and bootstrap circuits, synchronisation, applications. 6

**References:**

1. Electronic Principles – Malvino
2. Electronic Devices & Circuits – Robert Boylestad
3. Electronic Devices & Circuits – Allen Mottershead
4. Integrated Electronics – Millman Hilkias
5. Art of Electronics – Horowitz Winfield Hill

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COMMUNICATION ENGINEERING-I

Code: ET-401 L-T-P: 3-0-4

Total Marks: 100 Theory: 28/70 Sessional: 15/30 Hours

1. INTRODUCTION: Introduction to communication systems, electromagnetic wave and spectrum, radio frequency bands. Types of signals, analog and digital signals, spectrum of signals, telecommunication services, transmission paths. 3
2. MODULATION: Introduction and concept of modulation, necessity and definition of modulation. Types of modulation: analog modulation (AM, FM and PM) and pulse modulation (PAM, PWM, PPM, PCM and DPCM). High and low level modulations. Amplitude Modulation: Definition and frequency spectrum of the AM, representation of AM, power relations in the AM wave. Generation of AM basic requirements – comparison of levels, Grid modulated class C amplifier, plate modulated class C amplifier, modulated transistor amplifiers. Double sideband and single sideband techniques, evolution and description of DSB and SSB, suppression of carrier by the balanced modulator, ring modulator, suppression of the unwanted side- band: the filter system, the phase shift method, the ‘third’ method, comparison between DSB and SSB. Extension of SSB: Carrier reinsertion – Pilot-carrier systems, Independent-Sideband (ISB), vestigial sideband transmission. Application of AM circuit. Frequency Modulation (FM): theory of frequency and phase modulation: their definitions and descriptions of systems. Mathematical representation of FM, frequency spectrum of the FM wave, Phase Modulation, Intersystem comparisons. Generation of frequency modulation: FM methods, stabilised reactance modular – AFC, indirect method. Application of FM and PM circuits. 14
3. RADIATION AND PROPAGATION OF WAVES: Electromagnetic radiation – Fundamentals of electromagnetic waves, effects of the environment. Propagation of waves – ground (surface) waves, sky wave propagation – The ionosphere, space waves, LOS propagation. 6
4. TRANSMISSION LINES: Basic Principles – fundamentals of transmission lines, characteristics impedance, losses in transmission lines, standing waves, standing wave ratio, quarter and half wavelength lines, impedance matching, reactance properties of transmission lines. Transmission lines components: the double stub, directional couplers, baluns and the slotted line. 6
5. ANTENNAS: The radiation mechanism, elementary doublet. Resonant and non resonant antennas. Terms and definitions: antenna gain, directive gain, directivity and antenna gain, antenna resistance, radiation resistance, bandwidth, beam width and polarisation. Effects of ground on antennas, grounding systems, effects of antenna height. Dipole arrays, folded dipole antenna and applications. Types of practical antenna and their application fields: Non resonant antennas (the rhombic), antennas with parabolic reflectors, horn antennas, lens antennas, helical antennas, discone antennas, log-periodic antennas, loop antennas, phased arrays. 7
6. LINE COMMUNICATION: Introduction to telephony, basic telephone components and functions, telephony instruments, telephone sets, transmission bridges and telephone relays. Communication through telephones: local battery exchange, central battery exchange, automatic telephony – uni-selector and two motion switches, electronic exchanges. Elements of long distance telephony routing codes and signalling systems, telephone exchanges (switches) and routing, practical aspects. 6

References:

1. Communication Engineering – A. Kumar
2. Principles of Communication Engineering – Anokh Singh
3. Electronic Communication – Kennedy
4. Electronic Communication – Reddy & Coolen.

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COMMUNICATION ENGINEERING-I LAB

Code: ET-401(P) Total Marks: 50 Practical: 12/25 Sessional: 13/25

1. Study of tuned circuits.
2. Study of DSB-FC modulator
3. Study of DSB-SC modulator
4. Study of SSB modulator
5. Study of FM modulator
6. Study of Transmission Lines
7. Study of different types of antennas
8. Study of EPBX.

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ELECTRONIC TESTS & MEASUREMENTS

Code: ET-402 L-T-P: 4-0-0

Total Marks: 100 Theory: 28/70 Sessional: 15/30 Hours

1.0 ELECTRONIC MULTIMETER: Disadvantages of ordinary Volt-Ohm Meter (VOM), construction and operation of bridge type electronic multimeter using Vacuum Triode, BJT and FET, measurement of DC and AC voltage and current and resistance on EMM, comparison of ordinary VOM and EMM, basic principle of operation and chopper type electronic DC Voltmeters. Block diagram and principle of operation and working of different types of Digital Multimeter (DMM), DMM specifications, errors in DMM measurements, comparison of DMM & analog multimeter. 6

2.0 CATHODE RAY OSCILLATORS (CRO): Construction of Cathode Ray Tube (CRT), parts of CRT and their function – electronic gun, pre and post deflection electrodes, X and Y deflection plates and focussing, block diagram of CRO – vertical and horizontal deflection stays, trigger section, synchronisation and power supply. Special features of dual trace, double beam, delayed sweep and storage oscilloscope.

 Specification of Oscilloscopes and their significance, front panel controls, types of Oscilloscope probes, their characteristics and applications. Methods of measurements of amplitude, frequency, time period and phase shift using oscilloscope. 10

3.0 SIGNAL GENERATORS: A.F. & R.F. signal generators – construction and working principle, amplitude and frequency modulation, their specification and application. Block diagram, working principle, specifications and applications of pulse and function generators. 6

4.0 SIGNAL ANALYSIS: Block diagram, working and applications of tuned frequency wave analysis, heterodyne wave analyser, harmonic distortion analyzer, inter modulation distortion analyzer and distortion factor meter and their comparison. 6

5.0 TIME AND FREQUENCY MEASUREMENT: Measurement of frequency by resonance and heterodyne methods. Block diagram and working principle of digital frequency counter, measurement of frequency, time period and time interval using frequency counters. 4

6.0 AF AND RF POWER MEASUREMENT: Measurement of power at audio frequency – principle of operation and applications of audio power meter. Radio frequency power measurements: Bolometer and calorimetric methods.

7.0 AUTOMATED MEASUREMENTS AND DATA ACQUISITION SYSTEM: Concept of automated tests and measurements, block diagram of automated measurement system, characteristics and use of switching system, characteristics and use of switching matrices. Introduction to Data acquisition system – an overview of IEE-488 interface bus specification, advantages and application of computerised data acquisition.

References:

1. Electrical & Electronic Measurements and Instrumentation – A.K. Sawhney
2. Electronic Measuring & Measuring Instruments – Helfrick & Cooper
3. Electronic Instruments & Measurements – Larry Jones
4. Electrical & Electronic Measurements and Instrumentation – S. Ramabhadran
5. Electronic Instrumentation & Measuring Techniques – Cooper

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COMPUTER PROGRAMMING

Code: ET-404 L-T-P: 2-1-6

Total marks: 100 Theory: 28/70 Sessional: 15/30 Hours

1. OVERVIEW OF PROGRAMMING: Steps in program development, problem identification, task analysis, flowcharting as a roadmap of the algorithm, program coding, testing, debugging etc. Programming language classification: machine language, assembly language, third generation language, fourth generation language, assemblers, compilers, interpreters. Programming techniques: top-down design, bottom-up design, modular design and structured programming. 3
2. C LANGUAGE PROGRAMMING: An overview of C language, history of C language. The structure of a C program, data types, char, int, float, double, void. Constants: integer constants, character constants, floating constants, logical constants, string constants. Variables: integer variables, real variables, character variables, floating variables, logical variables, string variables. Declaration: scope of variables, local variables and global variables. Modifiers: signed, unsigned, long, and short. Storage class specifiers: extern, auto, static, register. 8
3. C STANDARD LIBRARY AND HEADER FILES: Header file: stdio.h, ctype.h, string.h, math.h, stdlib.h, stdarg.h. Standard library functions: string functions, mathematical functions, data and type functions, variable arguement list functions. 3
4. EXPRESSIONS, OPERATIONS AND ASSIGNMENT: Operators: arithmetic operators, increment and decrement operators, modulo division operator, relational operators, logical operators, bitwise operators, the ? operators, the comma as an operator, the precedence of operators. Expressions: definition, type conversion in expressions, type casting. Assignment statements: general form, type conversion in assignments, variable initialisation. 4
5. CONTROL STATEMENTS: The ‘if’ statement, general form, nested if, the if-else-if ladder, the ? as an alternative to if. Switch statement, general form, nested switch statements. For, while, do-while, break, continue, exit() function. Goto and label declarations.
6. CONSOLE I/O: Unformatted console I/O functions, getchar(), putchar(), gets, puts(). Formatted console I/O, sprintf(), scanf().
7. ARRAYS: Declaration, single dimensional arrays, two dimensional arrays, multi-dimensional arrays.
8. FUNCTION: General form, declaration and prototypes, function arguements. The return statement, returning values from function, function call, call by value, call by reference. Scope rules of functions, calling functions with arrays. Argc and argv – arguements to main().
9. POINTERS: The & and \* operators. Pointer expressions, pointer assignments, pointer arithmetic, pointer comparison. The dynamic allocation functions malloc and calloc. Pointers v/s arrays, arrays of pointers, pointers to pointers, initialising pointers, pointers to functions, function returning pointers, function with variable number of arguements.

References:

1. Programming Languages – Terence W. Pratt
2. Programming language Theory and its implementation – M.J. Gordon
3. The C programming language – Kerningham and D.M. Ritchie
4. Advanced Programming and Problems Solving with Pascal – Schncider & B. Wiley
5. C Programming and Practices – Tim Grady.

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COMPUTER PROGRAMMING LAB

Code: ET-404 (P)

Total Marks: 50 Practical: 12/25 Sessional: 13/25

1. Some simple exercises on: (i) Data type conversion, (ii) To differentiate between prefix and postfix operators.
2. To test whether a given number is even or odd.
3. To find the factorial of a number: Successive & non-successive methods.
4. To form a pyramid of numbers for a given number.
5. Some examples to explain the storage screen.
6. Bubble sort, Selection sort, Checking for Palindrome.
7. Multiplication of a matrix and transpose of a matrix.
8. Program to realise the register arithmetic operation.
9. Program to realise the string built in function: strcmp(), strcat(), strxcat(), strxcmp().
10. Realisation of bubble sort: Bubble sort, Selection sort, Quick sort, All string built in functions using pointer technique.

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DIGITAL ELECTRONICS

Code: ET-403 L – T – P: 3 – 0 – 3

Total Marks: 100 Theory: 28/70 Sessional: 15/30 Hours

1. NUMBER SYSTEM: Understanding number system, binary, octal decimal, hexadecimal number systems and their conversion. Representation of binary number system. Signed and unsigned number system, 1’s complement and 2’s complement, number multiplication, division, subtraction and addition of binary numbers. Different coding systems i.e. binary code, BCD code, Excess-3 code, Gray code, ASCII code and Parity code. 5
2. LOGICAL GATES: Concept of logical gates, definition and truth table of OR, AND, NOT, NOR, NAND, X-OR, X-NOR gates. Universal logic gates, tri-state gates, buffers. Logic families: RTL, DTL, TTL, ECL and CMOS, their comparison. 4
3. BOOLEAN ALGEBRA: Principles of Boolean Algebra, definition of Boolean constant, variables and function, the rule of Boolean Algebra. De-Morgan’s theorem, analysis of the operation of logical gates, realisation of Boolean expression logic gates. Simplification of compound Boolean expression, Algebraic and K-Map method of simplification, don’t care condition. Arithmetic circuits – Half Adder, Full Adder, Half Subtractor, and Full Subtractor. 8
4. FLIP – FLOPS: Flip – Flops, Latch, R-S, J-K, T, D flip flops, clocked flip-flop, Master Slave J-K flip-flop. 4
5. REGISTERS & COUNTERS: Shift Register, serial in serial out (SISO), serial in parallel out (SIPO), parallel in series out (PISO), parallel in parallel out (PIPO). Counters: Synchronous, asynchronous counter, Ring counter, Up/Down counter. 4
6. COMBINATIONAL DIGITAL SYSTEMS: Binary Adders, Digital Comparator, parity checker/ generator. Decoder/ Demultiplexer, data Selector/ Multiplexer, Encoder. BCD to Segment Decoder. 6
7. CONVERTER CIRCUITRY: Digital to Analog converters and Analog to Digital converters. 5
8. MEMORY DEVICES: Introduction, classification & characteristics of memories. ROM architecture, types and applications. RAM – static, dynamic. Magnetic memories: Magnetic Tape, Disk, Hard Disk, Floppy Disk, Optical Disks (CDs). Introduction to PLA, PAL, GALs, FPLA. 6

References:

1. Modern Digital Electronics – R.P. Jain
2. Digital Principles & Application – Malvino & Leach
3. Digital System – Ronald Tocci
4. Digital Fundamentals – Thomas L. Floyd
5. Digital Electronics – Douglas V. Hall

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DIGITAL ELECTRONICS LAB

Code: ET-403 (P) Total marks: 50 Practical: 12/25 Sessional: 13/25

1. Realisation of basic gates
2. Experiments on Flip-Flops.
3. Experiments on Registers & counters.
4. Experiments on Adders and Subtractors.
5. Experiments on Multiplexer and Demultiplexer.
6. Experiments on Decoder and Encoder.
7. Experiments on Seven Segment Display.
8. Experiments on Digital to Analog Converter.
9. Experiments on Analog to Digital Converter.
10. Experiments on Memory ICs.

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