VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

T.Y. BSc

Electronics

Paper-VI

Linear Circuits and Application

DIFFERENTIAL AMPLIFIER :

Differential amplifier circuit configurations, Dual input balanced output Differential amplifier, dual input unbalanced output differential amplifier, FET Differential amplifier, constant current bias, current mirror, cascaded Differential amplifier stages, level translator.

OPERATIONAL AMPLIFIERS :

The operational amplifier, block diagram of Op-Amp, an ideal Op-amp and its performance quantity, analysis of Op-Amp. Equivalent circuits, integrated circuits its development, types and pin identification, voltage-series feedback amplifier, voltage-shunt feedback amplifier, input offset voltage-current, bias current, output offset voltage, noise,CMRR.

FREQUENCY RESPONSE OF AN OP-AMP :

Frequency response, compensating networks, frequency response of internally compensated Op-Amps. Frequency response of non-compensating Op-Amps. High frequency Op-Amp equivalent circuit. Open-loop voltage gain, closed-loop frequency response, circuit stability, slew rate.

INVERTING AND NONINVERTING AMPLIFIERS :

Inverting amplifier, inverting adder and audio mixer, multichannel amplifier, inverting averaging amplifier, voltage follower, noninverting amplifier, ideal voltage source, combine inverting-noninverting amplifiers.

ACTIVE FILTERS AND OSCILLATORS :

Active filters, first second order low-high pass Butterworth filter, higher order filters, band pass-reject filters, all pass filter, oscillators, phase shift oscillator, Wein bridge oscillator, Quadrature oscillator, Square-wave generator, triangular-wave generator, sawtooth wave generator, voltage-controlled oscillator.

COMPARATORS AND CONVERTERS/CONTROLS :

Basic comparator, zero-crossing detector. Schmitt trigger, comparator characteristics limitations of Op-Amps as comparators, voltage limiters, high-speed and precision type comparators, window detector, voltage-to-frequency

converters and vice versa, analog-to-digital conversion theory, quantization error, conversion time, along-to-digital conversion theory, quantization error, conversion time, analog-to-digital and digital to analog converters (binary weighted, R 2R ladder network, monolithic, ADC 0808, etc), multichannel a/D converters, clippers and champers, absolute value output circuit, peak detector, sample-and-hold circuit.

GENERAL LINEAR APPLICATIONS :

DC and AC amplifier, peaking amplifier, summing, scaling, and averaging amplifiers, instrumentation amplifier, differential input and differential output amplifier, voltage-to-current converter with floating-grounded load, current-to-voltage converter, very high input impedance circuit, integrator, differentiator.

NONLINEAR ANALOG CIRCUITS :

Introduction, precision rectification, analog multipliers, phase-locked loops.

SPECIALIZED IC APPLICATION :

Universal active filter, Switched capacitor filter, 555 timer IC and its application (multivibrator, driving relays, LED's linear ramp and timing generator, long duration timer, pulse width modulation using control voltage pin,etc), 565 PLL IC block diagram, VCO and application of PLL, power amplifiers, voltage regulators. Concept of feed back regulators, IC 723 voltage (fixed, adjustable, switching and special) regulator, variable output voltage regulator, short circuit-overload protection, fixed voltage regulators (78XX & 79XX), specification and design principles, voltage inverter,

CASE STUDY :

SELECTED IC SYSTEM PROJECTS power supply, audio function generator, LED temperature indicator, digital DC motor speed control, timer application of LM 380.

LIST OF RECOMMENDED BOOKS :

1. R.A. Gayakwad, Op-Amps and Linear Integrated Circuits Technology, PHI, New Delhi.
2. R. A. Gayakwad, Op. Amps and Linear Integrated Circuits, 4th Ed International Ed, Prentice-Hill.
3. P. R. Gray & R. G. Meyer, Analysis and Design of Integrated Circuits, 2nd Ed, John Wiley & Sons.
4. R. F. Coughlin & A. F. F. Driscoll Amplifiers and Linear integrated Circuits, 3rd Ed, PHI, New Delhi.

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Paper-VII

Analog and Digital Communications

ANALOG COMMUNICATION :

Communication as means of information transfer, information as wave continuously varying in amplitude, frequency and phase need for modulation and multiplexing.

Principles of modulation, amplitude modulation, angle and phase modulation , side bands and spectrum, frequency and power spectra in amplitude modulation, techniques of AM generation, modulation transistor amplifier, grid modulation class C amplifier, balanced modulator, SSB modulation, vestigial side band modulation, frequency and phase modulation, frequency spectrum in FM, FM generation, Armstrong FM system, block diagram of AM and FM transmitter.

AM wave demodulator, square law detector, linear diode detector, average and envelop, FM wave demodulation, amplitude delimiters frequency discriminator, the ratio detector , AM receiver, super heterodyne receiver, FM receiver, AGC and AVC circuits AFC.

Television scanning and interface scanning synchronization and blanking, video signals, bandwidth for TV signals, vestigial side band system. Television bands and channels, television camera tubes, image orthicon and vidicon television receiver tuners, IF receivers, video detection and video amplifier, picture tube, sound section, sweep circuit and synchronization colour television block diagram of television transmitter, RADAR and its functional block diagram, pulsed RADAR & RADAR range equation.

DIGITAL COMMUNICATION :

Advantages/disadvantages of digital transmission, information theory and channel capacity, Hartley-Sannon law, pulse modulation, PCM, S/H circuit, PCM codes, folded binary codes, range coding efficiency, S/N quantization ratio, linear v/s non-linear PCM codes, idle channel noise, companding, analog companding, A-law, II-law, digital companding examples and frequency division multiplexing (in brief).

FIBER OPTIC COMMUNICATION :

Introduction to Fiber optics, principles of light transmission in fiber, propagation within a fiber effect of index profile on propagation, single mode propagation, losses in fibers, Rayleigh scattering losses, absorption losses, leaky modes, mode coupling losses bending losses, combined losses of fibers, dispersion, internal dispersion, material dispersion waveguide dispersion, internal dispersion, material dispersion, waveguide dispersion, light sources, LEDs, semiconductor lasers, photo detectors, p-n PIN, avalanche connectors and splices.

LIST OF RECOMMENDED BOOKS :

1. Taub & Shilling, Principles of Communication system,
2. W. F. Tomasi, Telecommunications, Prentice Hall
3. B. Grob, Basic Television,
4. G. Kennedy, Electronic Communication Systems,
5. D. Reddy, J Coolean, Electronics Communication,
6. Jeff Hecht, Understanding Fiber Optics, BPB Publications, New Delhi.
7. G. K. Mittal, radiio Engineering, Khann Publications.
8. B. P. Lodhi. Image Digital Communication
9. Calson , Communication System,

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Paper-VIII

Microprocessor and Microcontroller Interface

Revision of instruction set and addressing modes of 8085A microprocessor, brief revision of assembly language programmes covering complete instruction set.

INTERFACING WITH 8085A :

Memory interface, expanding memory size, various address decoding techniques, key board interface, hardware approach to keyboard display, interfacing with 8085A using 8279, PPI 8255 ; pin and block diagram, basic operation and interfacing various registers and operation modes of 8255A, programming and interfacing of 8255A with examples, PTT 8253 ; pin and block diagram, data bus buffer, control word register and control word format programming and interfacing of 8253, PIC 8259 ; pin and block diagram, hardware polling, data bus buffer, read/write control logic and functional description, operation and initialization of 8259, DMA controller 8257 ; pin and functional diagram, operation and programming of 8257.

DATA TRANSFER SCHEMES OF 8085A :

Parallel and serial transmission, different I/O methods, various data transfer schemes, USART transmitter and receiver, interfacing and programming of USART, concept of RS232-C interface.

MICROCONTROLLER HARDWARE ARCHITECTURE :

MCS-51 family overview pin configuration of 8051, I/O pins and port structure, port0, port1, port2, port3, PSEN,ALE,EA,RST, on chip oscillator configuration, memory organization, special function registers, external memory access, addressing decoding.

INSTRUCTION SET :

Addressing modes; register addressing, direct addressing, indirect addressing, immediate addressing, relative addressing, absolute addressing, long addressing, indexed addressing, instruction set ; arithmetic instruction flags, addition, subtraction, multiplication, division, logical instruction, bit-level and byte level logical operations, rorate and swap operations, data transfer instruction, external data moves, code memory read-only moves, data exchanges Boolean and programme branching instruction, jump and call instructions.

OPERATION :

Timer operation : TMOD, TCON, timer modes flags, clocking and controlling timers, baud rate generation, Serial port operation : Serial port control register, various modes pf operations, 8bit shift register mode0, 8bit UART with variable baud rate (model), 9bit UART with fixed baud rate (mode2), 9bit UART with variable baud rate (mode3), initialization and accessing serial port registers, multiprocessor communications, serial port baud rate.

INTERRUPT OF 8051 :

8051 interrupt organization, enabling an disabling interrupts, interrupt priority and polling, interrupt vectors , serial port interrupts, external interrupts timings, interrupt service routine,

APPLICATION EXAMPLES/CASE STUDY :

Hexadecimal keyboard interface, seven segments LEDs display interface, RAM interface, D/A and A/D conversions, multiple interrupts, etc.

LIST OF RECOMMENDED BOOKS :

1. I. Scott Mackennize, The 8051 Microcontroller, 2nd Ed 1995, Prentice Hall.
2. Kenneth J Ayala, The 8051 Microcontroller Architecture, programming & applications, 2nd Ed, Penram International Publishing (India) Mumbai.
3. R S Gaonkar

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Paper-IX

Measurement and Instrumentation

MEASUREMENT SYSTEM AND ANALYSIS :

Functional elements of an instrument, input output configurations of measuring instruments and instrument systems, methods of correction for interefying and modifying inputs.

Generalized performance, characteristics of instruments, dynamic characteristic, static stiffness and input impedance, generalized mathematical model of measurement system, operational transfer function, sinusoidal transfer function, zero, first and second order instruments, frequency, ramp and step responses of first and second instruments.

INDUSTRIAL INSTRUMENTATION :

Pressure measurement, dynamic response consideration, Burdon tube, diaphragm and below gauges electrical method, potentiometric devices, strain gauge transducer, variable reluctance sensor, variable capacitance devices, piezo electric pressure transducer, digital pressure transducer, LVDT.

Flow measurement, introduction, classification of flow methods, magnetic flow method, hot wire anemometer, laser anemometer, ultrasonic flow meter.

ELECTRONIC INSTRUMENTATION :

Pulse and square wave generator, function generator, wave analyzer types, harmonic distortion analyzer.

Analyzers, function generator, pulse and square-wave generator, oscillators, oscilloscope, CRT, CRT, graticule, basic CRO circuit, time-base generators, free-running mode, triggering mode, synchronization delay line CRO probes, special purpose CRSs, digital storage CRO, curve tracer, transistor tester, digital IC tester, linear IC tester, logic probe and logic state analyzer.

Analog multimeter, electronic analog multimeter, volt ohm meter, FET input volt ohm meter, micro volt meter, digital voltmeter, digital frequency meter, digital multimeter, digital panel meter.

Decade counting assembly, universal counter timer, electronic phase meter.

TROUBLESHOOTING TECHNIQUES :

Maintenance, need common faults, corrective maintenance and methods of fault locations, sequential and non-sequential checks, random check, half split, beginning to end technique.

Testing of passive components, testing of electronic equipments like tape recorder and radio receiver, measuring instrument, trouble shooting, symptoms, determination and evaluation, location of trouble to functional unit, trouble shooting in instruments like VOM,CRO, generators.

LIST OF RECOMMENDED BOOKS :

1. W D Cooper, Electronics Instrumentation and Measurement Techniques, PHI, New Delhi.
2. B E Jones, Instrumentation, Measurements, and Magnitudes, THM, New Delhi.
3. D S Sonde, Monographs with Solid Sate Electronic Instrumentation Vol-I to IV,THM, New Delhi.
4. A P Malvino, Electronics Instrumentation Fundamentals.
5. E O Dobelin, Measurement Systems, McGraw Hill
6. Kalsi H S,

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List of Experiments/Laboratory work

There will be 200 (60 marks for Internal of which 30 marks for practical and 30 marks for project viva. The External evaluation is 140 marks) marks for the laboratory work. Each student is required to carry out major project and submit two copies of his/her project report. The project will carry 70 marks based on the viva-voice and demonstration of the project. The students will be examined for two practical (each of 35 marks) from within the list of the practicals/experiments.

1. Study of Differential Amplifier.
2. Measurements of Op. Parameters.
3. Inverting and non-inverting amplifier.
4. Study of Op.Amp. Multivibrator.
5. Study of Op.Amp. Oscillator.
6. Instrumentation amplifier.
7. Design, build and test Op.Amp multivibrator and function generators.
8. Study of comparator and zero crossing detector,
9. Study of IC 555 and its applications.
10. Study of 565 and its applications.
11. Study of active filters.
12. Study of D/A converter.
13. Study of AM and FM detector.
14. Study of Pulse Code modulation.
15. Study of frequency division multiplexing.
16. Experiments on Fiber optic kit/communication
17. Dispersion of light in terms of distance.
18. Study of Interfacing 8255 and application
19. Study of Interfacing 8155
20. Study of Interfacing 8253
21. Programming of 8051 microcontroller.
- **a.** Data transfer group
- **b.** Arithmetic group
- **c.** Bit operator group
- **d.** Port operation.
- **e.** Timer and counter group.
- **f.** Interfacing Hex Keyboard
- **g.** Interfacing display (LCD,LED)
- **h.** Interfacing ADC/DAC.