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॥ अंतरी पेटवू ज्ञानज्योत ॥

North Maharashtra University, Jalgaon

Syllabus for Third Year Engineering Degree Course in

INDUSTRIAL ELECTRONICS ENGINEERING

(w.e.f. July, 2000)

North Maharashtra University, Jalgaon

Syllabus for T.E. (Industrial Electronics Engineering)

(With effect from July, 2000)

Term I

Sr. No.	Subject Code	Subject	Teaching Scheme Hours / Week		Examination Scheme				
			Lectures	Practical	Paper duration Hours	Maximum Marks			
						Paper	Termwork	Practical	Oral
1		Microprocessors	4	2	3	100	25	–	–
2		Network Theory	4	2	3	100	25	25	–
3		Electronic Communication I	4	2	3	100	25	25	–
4		Control Systems	4	2	3	100	25	–	–
5		Electronic Circuits Design	4	2	3	100	25	25	–
		Total	20	10	–	500	125	75	–
		Grand Total	30		–	700			

Note - All Subjects from Sr.No. 1 to 5 are common with T.E. (Electronics Engineering)

Term II

Sr. No.	Subject Code	Subject	Teaching Scheme Hours / Week		Examination Scheme				
			Lectures	Practical	Paper duration Hours	Maximum Marks			
						Paper	Termwork	Practical	Oral
1		Industrial Electronics	4	2	3	100	25	–	–
2		Microprocessors and Microcomputers	4	2	3	100	25	25	–
3		Linear Integrated Circuits and Applications	4	4	3	100	25	25	–
4		Industrial Management ⋆	4	–	3	100	–	–	–
5		Electronic Drives and Control	4	2	3	100	25	25	–
6		Practical Training / Special Study/ Minor Project	–	–	–	–	25	–	–
		Total	20	10	–	500	125	75	–
		Grand Total	30		–	700			

Total Marks of Term I + Term II = 1400 Marks

Note - All Subjects from Sr.No. 1 to 4 are common with T.E. (Electronics Engineering)

⋆ Subject common with T.E. (Electronics, Electronics and Telecommunication Engineering)

Term I Paper 1
Microprocessor

Teaching Scheme :
Lectures : 4 Hrs./week
Practical : 2 Hrs./week

Examination Scheme :
Paper : 100 marks
(3 Hrs. duration)
Termwork : 25 marks

Unit 1

8085 Microprocessor architecture and memory interfacing : The 8085 microprocessor, address bus, multiplexed address/ data bus, control and status signals, power supply and clock frequency, externally initiated signals including interrupts, serial I/O ports, microprocessor communication and bus timings, demultiplexing the low-order bus, generating control signals, a detailed look at the 8085 microprocessor unit and its architecture, The ALU, flags, timings and control unit, instruction register and decoder, register array, decoding and executing an instruction. Example of an 8085 based microcomputer system, the 8085 machine cycles and bus timings, opcode fetch machine cycle, memory read machine cycle, how to recognize machine cycles. Memory interfacing, memory structure and its requirements, basic concepts in memory interfacing, address decoding, interfacing circuit, address decoding and memory addresses. Memory system of a 8085-based microcomputer, interfacing the 8155 memory section, interfacing the 8755 memory section, absolute vs linear decoding, working of a single-board 8085 based microcomputer. 20 marks (10 Hrs.)

Unit 2

Interfacing I/O devices : Basic interfacing concepts, peripheral I/O instructions, I/O execution, OUT instruction(8085), IN instruction, Device selection and data transfer, absolute vs linear-select decoding; input interfacing, interfacing I/Os using decoders, interfacing output displays, LED display for binary data, circuit analysis, program description, program statement, hardware description, seven-segment LED, interfacing circuit and its analysis; interfacing input devices, data input from DIP switches, interfacing circuit using 74LS138 3 to 8 decoder and tri-state octal buffer (74LS244), multiple port addresses, instructions to read input port, memory-mapped I/O, execution of memory-related data transfer instructions, application of memory-mapped I/O technique. 20 marks (10 Hrs.)

Unit 3

Introduction to 8085 assembly language programming : The 8085 programming model, registers, accumulator, flags, program counter (PC), Stack pointer (SP); instruction classification, data transfer (copy) operations, arithmatic operations, addition, substraction, increment/decrement,-logical operations, AND, OR, Exclusive-OR, Rotate, Compare, Complement, branching operations, Jump, Call, Return and Restart, machine control operations; instruction format, instruction wordsize, one-byte instructions, two-byte instructions, three-byte instructions, opcode format, to write, assemble and execute a simple program, problem statement, problem analysis, flow chart, assembly language program, from assembly language to hexcode, storing in memory and converting from hexcode to binary code, executing the program; Overview of the 8085 instruction set, memories and tasks, arithmatic instructions, logical instructions, branch instructions, machine control instructions, how to recognize number of bytes in an instruction, one-byte instructions, two-byte instrucions, three-bytes instruction. 20 marks (10 Hrs.)

Unit 4

Introduction to 8085 instructions : data transfer (copy) operations, MOV, MVI, OUT, IN, HLT, NOP; addressing modes, immediate addressing, register addressing, direct addressing, indirect addressing; Flowchart, symbols; Assembly language program, translation from assembly language to machine language, program format, memory address, machine code, opcode, operand, comments, to enter and execute the program, to execute a program without an output port; program: data transfer to control output devices, problem analysis, program, program output; arithmatic oprations, ADD, ADI, SUB, SUI, INR, DCR; Flag concepts and cautions, carry flag, zero flag, sign flag, program : arithmatic operations-addition and increment, substraction, program : Substraction of two unsigned numbers; logic operations; branches operations, unconditional Jump, JMP, conditional jumps, JC, JNC, JZ, JNZ, JP, JM, JPE, JPO, program : testing of the carry flag, problem statement, problem analysis and flow chart, assembly language program, using the instruction jump on carry (JC); debugging a program. 20 marks (10 Hrs.)

Unit 5

Programming techniques with additional instructions : looping, counting and indexing, continuous loop, conditional loop, conditinal loop and counter, additional data transfer and 16 bit arithmatic instructions, 16-bit data transfer to register pairs (LXI), data transfer (copy) from memory to microprocessor, data transfer (copy) from the microprocessor to memory or directly into memory, arithmatic operations related to 16-bits or register pairs, arithmatic operations related to memory, logic operations : Rotate, RLC, RAL, RRC, RAR; logic operations, compare, CMP, CPI. (8 Hrs.)
Z80 and 8800, b-bit microprocessors, architecture and special features. (2 Hrs.)
20 marks

2....

References :

1. Microprocessor Architecture, Programming and Applications with the 8085, third edition, Ramesh S. Gaonkar, Penram International (India).
2. 8085 Assembly Language programming, Leventhal, McGraw-Hill.
3. Microprocessors and Peripherals, B. Venkataramani and P. Somaskandan, Tata McGraw-Hill.
4. Microprocessors and Digital Systems, 2nd edition, Douglas Hall, McGraw-Hill.

List of Experiments :

1. Data transfer operations - 2 expts.
2. Addressing modes - 2 expts.
3. Arithmatic operations - 2 expts.
4. Testing of flags - 2 expts.
5. Logic operations - 2 expts.
6. Branch operations - 2 expts.
7. Logic operations : Rotate and Compare - 2 expts.

The termwork should include a minimum of eight experiments from the above list. The termwork marks will be based on performance in theory and practicals having a weightage of 40% and 60% respectively.

Term I Paper 2
Network Theory

Teaching Scheme :
Lectures : 4Hrs./week
Practical : 2 Hrs./wekk

Examination Scheme :
Paper : 100 marks
(3 Hrs. duration)
Termwork : 25 marks
Practical : 25 marks

Unit 1

Topological description of networks : graph, oriented graph, branches, nodes, planar and non planar graphs, subgraph, trees and chords. Network equations, number of network equations, source transformations, formulation of network equations, loop variable analysis, node variable analysis, Determinants : minors and Gauss elimination method, duality, state variable analysis. Initial conditions in networks, procedure for evaluating initial conditions, initial state of a network.

20 marks (10 Hrs.)

Unit 2

Second order differential equation; internal excitation, solution and initial conditions; networks excited by external energy sources, solution and initial conditions. Laplace transformation : transforms of linear combinations, transforms of derivatives, transforms of integrals; solution of problems with the Laplace transformation; Partial fraction expansion, Heaviside's expansion theorem. Examples of solution by the Laplace transformation. Laplace transforms of standard functions, shifted waveforms, unit step, ramp, impulse; initial and final value of f(t) from F(s). 20 marks (10 Hrs.)

Unit 3

Impedance functions and network theorems : concept of complex frequency, transform impedance and transform circuits, series and parallel combinations of elements; superposition and Reciprocacity, Thevenin's theorem and Norton's theorem, Examples. Network functions; Poles and Zeroes: Terminal pairs or ports, network functions for the one port and two-port, driving-point impedance (or admittance), voltage transfer function, current transfer function, transfer impedance (or admittance), calculation of network function, ladder networks, bridged-T, parallel-T and lattice networks, Examples; Poles and zeroes of network functions, restrictions on pole and zero locations for diving-point functions, restrictions on pole and zero locations for transfer functions; time-domain behaviour from the pole and zero plot. 20 marks (10 Hrs.)

Unit 4

Two-port parameters : Z parameters, Y parameters, transmission parameters (A,B,C,D), relationship between parameter sets; parallel connection of two-port networks. Fourier series and signal spectra : Fourier series, evaluation of Fourier coefficients, waveform symmetries as related to fourier coefficients; Exponential form of the Fourier series.

20 marks (10 Hrs.)

Unit 5

Network synthesis : Positive real functions, frequency response of one-port driving point functions. Realization of LC, RL and RC driving point functions in Foster and Cauer forms. 20 marks (10 Hrs.)

3....

References :

1. Network Analysis, 3rd edition, M.E. Van Valkenburg, Prentice-Hall of India.
2. Circuits and Networks- Analysis and Synthesis, Sudhakar and Shyammohan, Tata McGraw-Hill.
3. Networks and Systems, D. Roy Choudhary, New Age International.

List of Experiments :

1. Verification of Thevenin's theorem for a two-port reactive network.
2. Verification of Norton's thorem for a two-port reactive network.
3. Pole and Zero plot of a one-port network.
4. Measurement of Z parameters of a two-port network.
5. Measurement of Y parameters of a two-port network.
6. Measurement of transmission parameters (A,B,C,D) of a two-port network.
7. To plot the amplitude and phase response of an all pass network.
8. To plot the frequency response of a one-port RC driving point function in Foster form.
9. To plot the frequency response of a one-port RC driving point function in Cauer form.
10. To find Y parameters of two T-networks connected in parallel.

The termwork should include a minimum of eight experiments from the above list. The termwork marks will be based on performance in theory and practicals having a weightage of 40% and 60% respectively.

Term I Paper 3
Electronic Communication I

Teaching Scheme :
Lectures : 4 Hrs./week
Practical : 2 hrs/week

Examination Scheme :
Theory paper : 100 marks
(3 Hrs. duration)
Termwork : 25 marks
Practical : 25 marks

Unit 1

Single-side band AM techniques : Evolution and description of SSB; Suppression of carrier, balanced modulator; Suppression of unwanted sideband, filter system, phase-shift method; Extensions of SSB, forms of amplitude modulation, carrier reinsertion-pilot-carrier systems, Independent-side band (ISB) systems, vestigial-sideband transmission.

20 marks (10 Hrs.)

Unit 2

Demodulation of SSB : Product modulator, detection with the diode balanced modulator. SSB Receivers : Pilot carrier receiver, Suppressed-carrier reciever. AM reciever circuits : RF amplifiers, FET mixer, bipolar transistor mixer, IF amplifiers, Automatic gain control (AGC), Delayed AGC circuit, Squelch (muting) circuit. 20 marks 10 Hrs.)

Unit 3

FM reciever circuits : RF amplifiers, Amplitude limiter, Phase discriminator, ratio detector, balanced ratio detector, Pre-emphasis and de-emphasis circuits. Noise figure : noise calculations, addition of noise due to several sources, addition of noise due to several amplifiers in cascade, noise in reactive circuits; calculation of noise figure, noise figure from equivalent noise resistance; Noise figure from measurement; Noise temperature. 20 marks (10 Hrs.)

Unit 4

Broad band communication systems : Communication medias, coaxial cables, fiber-optic links, microwave links, Tropospheric Scatter links; Submarine cables, fiber-optic submarine cables, Satellite communications. Elements of long-distance telephones, routing codes and signalling systems, telephone exchanges and routing; Practical aspects, International gateways, echo and echo suppressors; introduction to traffic engineering, measurement of traffic and grade of service.

20 marks (10 Hrs.)

Unit 5

Radar Systems : Basic principles, block diagram of an elementry pulsed radar, frequencies and power used in radar, radar performance factors, radar range equation, factors influencing maximum range, effects of noise. Pulsed radar system, block dalgram and description, modulators, reciever bandwidth requirements, factors governing pulse characteristics, antennas and scanning; display methods, a scope display, plan-position indicator; moving target indication (MTI), Doppler effect; radar beacons. CW doppler radar, advantages, applications and limitations. 20 marks (10 Hrs.)

4....

References :

1. Electronic Communication System, fourth edition, George Kennedy and Bernard Davis, Tata McGraw-Hill.
2. Electronic Communications, third edition, Dennis Roddy and John Coolen, Prentice-Hall of India.
3. Introduction to Radar Systems, Second edition, Merrill I. Skolnik, Tata McGraw-Hill.
4. Modern Communication Circuits, Second edition, Jack R.Smith, McGraw-Hill International edition.
5. An Introduction to Fiber Optic Systems, second edition, John Powers, Irwin/McGraw-Hill International edition.

List of Experiments :

Group A

1. RF amplifier for AM receiver.
2. FET mixer.
3. Bipolar transistor mixer.
4. IF amplifier.
5. Automatic gain control.
6. Squenich circuit.

Group B

7. Testing of AM reciever.
8. Testing of FM reciever.
9. RF amplifier for FM reciever.
10. Amplitude limiter for FM reciever.
11. Phase discriminator.
12. Ratio detector.

The termwork should include a minimum of eight experiments, four each froms group A and B of the above list. The termwork marks will be based on performance in theory and practicals having a weightage of 40% and 60% respectively

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Term I Paper 4
Control Systems

Teaching scheme :
Lectures : 4 Hrs./week
Practical : 2 Hrs./week

Examination Scheme :
Paper : 100 marks
(3 Hrs. duration)
Termwork : 25 marks

Unit 1

Elements of control systems, open-loop and closed-loop; feedback and its effects on overall gain, stability, sensitivity, external disturbance or noise, types of feedback control systems, linear and nonlinear, time-invariant and time-varying, continuous-data control systems, sampled-data and digital control systems. (2 Hrs.)

Transfer function, block diagram and signal flow graph; Impulse response and transfer functions of linear systems, single and multivariable systems, Block diagrams of control systems (Single-input single-output), Signal flow graphs, basic properties, definitions, signal-flow-graph algebra, Signal flow graph of a feedback control system, Examples of construction of signal flow graphs, general gain formula for signal flow graphs, application of general gain formula to block diagrams. State diagram and state equations (8 Hrs.)

20 marks

Unit 2

Control system components: potentiometer, Synchros, tachometer, dc and ac motors, principle of operation, modelling and transfer function (4 Hrs.)

Time-domain analysis of control systems : Introduction, typical test signals for the time response of control systems, step input, ramp input, parabolic input, steady-state error of linear systems; transient performance of linear control systems, maximum overshoot, delaytime, risetime and settling time, transient response of a second order system, natural frequency ω_n, damping factor δ, underdamped, critically damped and overdamped cases; Methods of determining stability of linear control systems, Routh-Hurwitz criterion. (6 Hrs.)

20 marks

Unit 3

Root-locus technique : Introduction, Basic properties of root loci, construction of the complete root loci, K=0 points, $K=\pm\infty$ points, number of branches, symmetry, asymptotes, intersection of the asymptotes (Centroide), root loci on real axis, anglee of departure (from poles) and the angles of arrival (at zeros), intersection of the loci with imaginary axis, breakwey points (Saddle points), calculation of K on the root loci, root sensitivity robustness of system.

20 marks (10 Hrs.)

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Unit 4

Frequency domain analysis of control systems : Transfer function of single variable, single loop control system, typical gain and phase characteristics of a feedback control system; Nyquist stability criterion, encircled versus enclosed, number of encirclement and enclosure, principle of argument, Nyquist path, Nyquist criterion and the F(s) or the G(s) H(s) plot, a simplified Nyquist plot, application of Nyquist criterion, frequency domain characteristics, peak resonance Mp, resonant frequency Wp, bandwidth, cutoff rate, relative stability-gain margin, phase margin and Mp,Bode plots for relative stability.

20 marks (10 Hrs.)

Unit 5

State varible analysis of linear dynamic systems : matrix representation od state equations, state transition matrix, significance and properties; state transition equation, relationship between state equations and transfer functions, characteristic equation, eigen values and eigen vectors, controllability and observability of linear systems.

20 marks (10 Hrs.)

References :

1. Automatic Control Systems, fifth edition, Benjamin C. Kao, Prentice-Hall of India.
2. Control Systems : Principles and Design, M. Gopal, Tata McGraw-Hill.

List of Experiments :

1. Closed-loop dc motor position-control system.
2. Closed-loop ac motor position control system.
3. Study of synchros.
4. Study of tachometer.
5. Modelling of a dc motor to find its transfer function.
6. Modelling of an ac motor to find transfer function.
7. Transient response of a second order system.
8. To study frequency response of lag n/w and to find its transfer function.
9. To study frequency response of lead n/w and to find its transfer function.
10. To draw Bode plots of a given network and find gain and phase margins.

The termwork should include a minimum of eight experiments from the above list. The termwork marks will be based on performance in theory and practicals having a weightage of 40% and 60% respectively.

Term I Paper 5
Electronic Circuits Design

Teaching Scheme :
Lectures : 4 Hrs./week
Practical : 2 Hrs./week

Examination scheme :
Theory Paper : 100 marks
(3 Hrs. duration)
Termwork : 25 marks
Practical : 25 marks

Unit 1

Single-transistor amplifiers : Inverting amplifiers – common-emitter and common-source circuits; Follower-circuits–common-collector and common-drain amplifiers; Non-inverting amplifiers -- common-base and common-gate circuits; Amplifier prototype review and comparison; Overall amplifier performance.

20 marks (10 Hrs.)

Unit 2

Single-transistor amplifier design examples : a common-collector/common-drain amplifier, a common-base/common-gate amplifier, a common-emitter/common-source design. The influence of body effect on amplifier performance.

20 marks (10 Hrs.)

Unit 3

Multistage amplifiers using BJTs and FETs : AC-coupled amplifiers; Direct-coupled amplifiers; Differential amplifiers; Evolution to basic operational amplifiers; output stages; Electronic current sources.

20 marks (10 Hrs.)

Unit 4

Frequency response of single transistor amplifiers : Low-frequency and high frequency response of BJT and FET amplifiers for all configurations.

20 marks (10 Hrs.)

Unit 5

Frequency response of multistage amplifiers : Differential amplifier; C-C/C-B cascade; cascade amplifier; Cutoff frequency for the current mirror; Three-stage amplifier example

20 marks (10 Hrs.)

References :

1. Microelectronic Circuit Design, Richard C. Jaeger, Mc-Graw-Hill International edition.
2. Practical Transistor Circuit Design and Analysis, Gerald E. Williams, Tata McGraw-Hill.
3. Transistor Circuit Design, Texas Instruments Inc., McGraw-Hill International edition.
4. Electronic Devices and Circuits, third edition, David A. Bell, Prentice-Hall International.

List of Experiments :

Group A

1. To measure Voltage gain, current gain, input resistance and output resistance of a single BJT amplifier and compare with the designed values
2. Same as in Exp 1 for a FET amplifier.
3. For an ac-coupled two stage amplifier using BJTs, measure voltage gain, current gain, input resistance and output resistance. Compare with the designed values.
4. Same as in Exp. 3 using FETs.
5. For a differential amplifier using BJTs, measure differential - mode and common - mode voltage gains. Calculate CMRR and compare with the designed value.
6. Same as in Exp.5 using FETs.

Group B

7. For a class-AB output stage, measure power gain and compare with the designed value
8. Plot the frequency response of a single BJT amplifier. Determine fL and fH. Compare with the designed values
9. Same as in Exp. 8 for a FET amplifier.
10. Plot the frequency response of a differential amplifier using BJTs. Determine the cut-off frequency and compare with the theoretical value (for differential - mode gain only).
11. Same as in Exp. 10 using FETs.
12. Plot the frequency response for a three-stage ac-coupled amplifier. Determine fL and fH and compare with the designed values.
13. Analysis of single stage BJT amplifier using computer program.
14. Analysis of single stage FET amplifier using computer program.

The termwork should include a minimum of eight experiments, four each from groups A and B of the above list. The termwork marks will be based on performance in theory and practicals, having a weightage of 40% and 60% respectively. In the theory paper, no design manuals or data books will be required. The questions will be set to analyse a part of the designed circuit or to design a part of the circuit using the specified devices and components. The pattern of the question paper will be the same as in other theory papers.

Term II Paper 1

Industrial Electronics

Teaching Scheme :
Lectures : 4 Hrs./week
Practical : 2 Hrs./week

Examination Scheme :
Paper : 100 marks
(3 Hrs. duration)
Termwork : 25 marks

Unit 1

Thyristors : SCR, Triac, Diac, SCS, SUS, LASCR, Symbols and V-I characteristics of each type. Methods of SCR turning on, turn-on characteristics, turn-off mechanism, turn-off characteristics. Device specification, ratings and nomenclature. Commutation of an SCR, natural and forced, classification of forced commutation, class A : resonant commutation, class B Self commutation, class C : auxiliary commutation, class D : complementary commutation, class E : external pulse commutation, class F : line commutation. Circuits for gate triggering, R, RC, pulse, UJT triggering. Internal power dissipation and temperature rise. 20 marks (10 Hrs.)

Unit 2

Multiple connections of SCRs, series operation, triggering of series connected SCRs, parallel operation, triggering of parallel-connected SCRs, string efficiency. SCR applications, Static circuit breaker, ac and dc, overvoltage protection, zero voltage switch, integral-cycle triggering, time delay circuit, soft start circuit. AC power control, phase control, half-wave control circuit, load current and voltage waveforms, effect of free wheeling diode, full wave control circuit, load current and voltage waveforms. 20 marks (10 Hrs.)

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Unit 3

Full wave controlled rectifiers, M-2 and M-6 connections, Bridge circuits, single phase B-2 connection, three phase B-6 connection, Alalysis of bridge circuits. Effect of source inductance. Half-controlled bridge circuits, single phase and three phase, alalysis. Line commutated controlled rectifiers, input-output characteristics of bridge circuits, effect of source impedance, effect of load inductance

20 marks (10 Hrs.)

Unit 4

Electronic control of heating and welding : Induction heating, high frequency power source for induction heating, Oscillator circuit used in induction heaters, spark-gap generator, Electronic heaters employed for induction heating, static generators used for induction heating, thyristorised supplies used in induction heating, Dielectric heating, Electric welding, forge welding, fusion welding, resistance welding, resistance welding equipment, control circuit for resistance welding, line contactor and heat control unit, non-synchronous weld timer, synchronous weld timer, sequence timer, thystorised control circuit for resistance welding. Energy storage system for welding.

20 marks (10 Hrs.)

Unit 5

Ultrasonics : Introduction, applications of ultrasonics, generation of ultrasonics, piezoelectric ultrasonic generator, magnetorestriction oscillator circuit, pulsed echo ultrasonic flow detection (5 Hrs.)

Thyristor control circuits : Automatic street lighting circuit using LDR and SCR; Emergency light using SCR; Automatic water level indicator using SCR, Automatic battery charger using SCR. (5 Hrs.)

20 marks

References :

1. An Introduction to Thyristor and their Applications, 2nd edition, M. Ramamoorty, East-West Press
2. Industrial Electronics and control, S.K. Bhattacharya and S. Chatterjee, Tata McGraw-Hill.

List of Experiments :

1. SCR triggering circuits (2 expts.)
2. SCR commutation circuits (3 expts.)
3. Zero voltage switch using SCR.
4. Integral cycle triggering.
5. Single phase full-wave controlled bridge rectifier.
7. Electronic resistance welding control.
8. Ultrasonic flaw detector.
9. Automatic battery charger using SCR.

The termwork should include a minimum of eight experiments from the list. The termwork marks will be based on performance in theory and practicals having a weightage of 40% and 60% respectively.

Term II Paper 2

Microprocessors and Microcomputers

Teaching Scheme :
Lectures : 4 Hrs./week
Practical : 2 Hrs./week

Examination Scheme :
Paper : 100 marks
(3 Hrs. duration)
Termwork : 25 marks
Practical : 25 marks

Unit 1

Counters and time delays . Counter, flow chart; time delay using one register, a register pair, loop within a loop technique; counter design with time delay; program : hexadecimal counter; program : zero-to-nine (modulo ten) counter, program : generating pulse waveforms. (2 Hrs.)

Stack and Subroutines : stack in an 8085 microcomputer system, PUSH and POP instruction ; program : resetting and displaying flags; subroutines, CALL and RET instructions; conditional call and return instructions. (2 Hrs.)

Code conversion, BCD arithmatic and 16-bit data operations . BCD-to-binary conversion, binary-to-BCD conversion, BCD-to-seven-segment-LED Code conversion, binary-to-ASCII and ASCII-to-binary code conversion, BCD addition, BCD substraction, 16-bit data transfer and data exchange group, LHLD, SHLD, XCHG. (6 Hrs.)

20 marks

Unit 2

Interrupts : 8085 interrupts, EI and DI instructions, RST instructions, inplementation of the 8085 interrupt, multiple interrupts and priorities, 8085 vectored interrupts, TRAP, RST 7.5, 6.5 and 6.5, Pending interrupts, RIM, RST instructions and breakpoint subroutine, programmable interrupt controller, 8259A, interrupt operation; direct memory access (DMA), HOLD and HLDA, DMA controller 8257 (5 Hrs.)

Interfacing data converters : digital-to-analog (D/A) converters, R/2 R-ladder network, interfacing an 8-bit D/A convertor with the 8085, hardware description, microprocessor compatible D/A converters AD 558; analog-to-digital (A/D) converters. successive-approximation A/D converter, interfacing an 8-bit A/D converter using status check, interfacing an 8-bit A/D converter using interrupt, hardware description, interfacing circuit of the ADC0801 with the 8085 microprocessor.

20 marks (5 Hrs.)

Unit 3

Programmable interface devices for 8085 : basic concepts in programmable devices, bidirectional tri-state octal buffer 74LS245, programmable device with a status register, programmable devices with handshake signals, programmable I/O devices 8155, 8355; programmable keyboard/display interface. (6 Hrs.)

Serial I/O and data communication : basic concepts in serial I/O, interfacing requirements, alphanumeric codes, transmission format, synchronous us asynchronous transmission, simplex and duplex transmission, rate of transmission (BAUD), error checks in data communication, parity check, data communication over telephone lines, standards in serial I/O, RS-232C; 8085-senal I/O lines : SOD and SID 20 marks (4 Hrs.)

Unit 4

Memory design : EPROM memory 2764, R/W memory 6116 and 6264, interfacing memory with wait states. (2 Hrs.)

Microcontroller 8051, block diagram description. (1 Hr.)

16-bit microprocessors : 8086/8088 microprocessors, memory segmentation, parallel processing, coprocessing, instruction set, modular programming. (2 Hrs.)

General-purpose programmable peripheral interface 8255A, block diagram description, mode 0 : simple input or output, BSR (Bit Set/Reset) mode. Interfacing A/D converter using the 8255 A in mode 0 and BSR mode, mode 1 : Input or output with handshake mode 2 : bidirectional data transfer. Programmable interval timer 8254, block diagram description modes 0 to 5. (5 Hrs.)

20 marks

Unit 5

Software development systems and assemblers : microprocessor-based software development systems, system hardware and storage memory, floppy disk, hard disk, CD-ROM (Compact disc ready-only memory); operating systems, MS-DOS operating system, OS/2 (operating system 2), UNIX operating system; tools for developing assembly language programs, editor, assembler, loader, debugger; MS-DOS cross-assemblers; assemblers and cross-assemblers; writing programes using cross-assembler, source programe, two-pass assembler, assembled list file, program : addition with carry, source program, print file, error messages. (5 Hrs.)

Microprocessor application : 8085 microprocessor unit design, address bus, data bus, control signals, frequency and power requirements, externally triggered signals, reset, interrupts, HOLD, READY; Designing a system : Single-board microcomputer, project statement, project analysis, keyboard, display, execute, system design, system buses and their driving capacity, keyboard and displays, software design, initialization display module, reading the keyboard and placing the byte in the buffer, performing functions, program coding, prototype building and testing. (5 Hrs.)

20 marks

References :

1. Microprocessor Architecture, Programming and Applications with the 8085, R.S. Gaonkar, Penram International (India).
2. Introduction to microprocessors, third edition, A.P. Mathur, Tata McGraw-Hill.
3. Microprocessors : Principles and Applications, Ajit Pal, Tata McGraw-Hill.
4. Microprocessors and Interfacing : Programming and Hardware, second edition, Douglas V. Hall, Tata McGraw-Hill.

List of Experiments :

1. Code conversion - 2 expts
2. Programmable interrupt controller 8259A.
3. DMA controller 8257.
4. A/D converter interfacing with 8085.
5. D/A converter interfacing with 8085.
6. Programmable I/O device 8155.
7. Programmable keyboard diasplay interface 8279.
8. EPROM memory 2764.
9. R/W memory 6116/6264.
10. Programmable interval timer 8254.
11. General-purpose programmable peripheral interface 8255 A.

The termwork should include a minimum of eight experiments from the above list. The termwork marks will be based on performance in theory and practicals having a weightage of 40% and 60% respectively.

Term II Paper 3
Linear Integrated Circuits and Applications

Teaching Scheme :
Lectures : 4 Hrs./week
Practicals : 4 Hrs./week

Examination Scheme :
Paper : 100 marks
(3 Hrs. duration)
Termwork : 25 marks
Practicals : 25 marks

Unit 1
OP-AMPs : Block diagram representation of a typical op-amp, analysis of typical op-amp equivalent circuits; op-amp parameters, input offset voltage, input offset current, input bias current, differential input resistance, input capacitance, offset voltage adjustment range, input voltage range, common-mode rejection ratio (CMRR), supply voltage rejection ratio (SVRR), open loop voltage gain, output voltage swing, output resistance, output short-circuit current, supply current, power consumption, slew rate, gain-bandwidth product, op-amp applications, dc amplifier, ac amplifier, peaking amplifier, instrumentation amplifier, current-to-voltage converter, integrator, differentiator. 20 marks (10Hrs.)

Unit 2
Active filters : low pass first and second order Butterworth filters, high-pass first and second order Butterworth filters, band-pass filter, band-reject filter, all-pass filter. Waveform generators: Square wave generator, traingular wave generator, sawtooth wave generator, voltage controlled oscillator 566. 20 marks (10 Hrs.)

Unit 3
Comparators and converters : basic comparator, zero-crossing detector, Schmitt trigger, voltage limiters, digital-to-analog converter, successive-approximation analog-to-digital converter, chippers and clampers, precision half-wave and full wave rectifiers, peak detector, sample-and-hold circuit. 20 marks (10 Hrs.)

Unit 4
Timer 555 : as a monostable multivibrator, astable multivibrator, free-running ramp generator. Phase-locked loops (PLL) operating principles, PLL 565, applications, frequency multiplier, frequency shift keying (FSK) demodulator.
LM380 power audio amplifier : circuit description, application. Voltage regulators : fixed voltage regulators, adjustable voltage regulators. 20 marks (10 Hrs.)

Unit 5
Function generator ICL8038 : Block diagram, connection diagram, application. LED temperature indicator : application of the V/F converter and the 555 timer. Siren/Alarm : application of the LM380 power amplifier. 20 marks (10 Hrs.)

References :

1. Op-Amps and Linear Integrated Circuits, 2nd edition, Ramakant A. Gayakwad, Prentice-Hall of India.
2. Operational Amplifiers Design and Applications, Graeme, Tobey and Huelsman, McGraw-Hill International edition.

List of Experiments :
1. op-amp parameters. (2 extps)
2. op-amp integrator.
3. op-amp differentiator.
4. Low-pass Butterworth filter.
5. High-pass Butterworth filter.
6. Band-pass filter.
7. Band-reject filter.
8. All-pass filter.
9. Square wave generator / triangular wave generator.
10. VCO 566
11. Schmitt trigger
12. 555 as a monostable multivibrator.
13. PLL565 as frequency multiplier.
14. op-amp clippers.
15. op-amp clamper.
16. Precision half-wave rectifier.

The termwork should include a minimum of twelve experiments from the above list. The termwork marks will be based on performance in theory and practicals having a weightage of 40% and 60% respectively.

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Term II Paper 4
Industrial Management

Teaching Scheme :
Lectures : 4Hrs./week

Examination Scheme :
Paper : 100 marks
(3Hrs. duration)
Termwork : 25 marks

Unit 1
Management science : Its growth, management, administration and organisation concept. Definitions of management. Functions of management. Division of labour. Authority and responsibility. Unity of command and direction.
20 marks (10Hrs.)

Unit 2
Business organisation : Form of organisations - their formation and working. Organisation structures in industry - line organisation, functional organisation, line and staff organisation. 20 marks (10 Hrs.)

Unit 3
Factors governing plant location. Objectives of good plant layout. Process layout, product layout and combination layout. Work study. Work measurement. Time study and motion economy. Flow process charts. Two handed process charts. Flow diagrams. Simo charts. string diagrams. Therbligs 20 marks (10 Hrs.)

Unit 4
Personnel management : Manpower planning, Sources of recruitment, selection and training. Job evaluation. Merit rating. Performance appraisal. Wage administration and systems of wage payments. Incentives. Motivation.
20 makrs (10Hrs.)

Unit 5
Financial management : Capital structure. Fixed capital. Working capital. Sources of finances and financing institutions. costing and cost control. Prime cost and overhead costs. Depreciation and depreciation methods. Break-even and minimum cost analysis. Value analysis Introduction and objectives of value engineering. Types of values. Value analysis. Value control. 20 marks (10 Hrs.)

References :—

1. Management for Business and Industry, C.S. George Jr.
2. Principles of Management, Koontz and O'Donnell.
3. Industrial Management, Spriegal W.R. and Lansburgh R.H.
4. Business Organisation and Management, M.C. Shukla.
5. Industrial Engineering and Management, O.P. Khanna.
6. Business Organisation and Management, S.A. Sherlekar.

Term II Paper 5
Electronic Drives and Control

Teaching Scheme :
Lectures : 4 Hrs./week
Practical : 2 Hrs./week

Examination Scheme :
Paper : 100 marks
(3 Hrs. duration)
Termwork : 25 marks.
Practical : 25 marks.

Unit 1
Drives - an introduction : block diagram description, advantages; parts such as electrical motors, power modulators, convertors-ac to dc, ac voltage controllers, dc to dc choppers, inverters, and cyclocomverter, variable impedances, switching circuits, sources, control unit; choice of drives; status of dc and ac drives. (2 Hrs.)
Dynamics of drives : Fundamental torque equations; speed torque connections and multiquadrant operation; equivalent values of drive parameters, loads with rotational motion, loads with translational motion, measurement of moment of inertia; components of load torques--friction torque, windage torque, torque required to do useful mechanical work; nature and classification of load torques; calculation of time and energy-loss in transient operations; steady state stability; load equalisation. (4 Hrs.)
Control of drives : modes of operation -- steady-state, acceleration including starting, deceleration including stopping; speed control and drives classifications -- variable speed drives, multi-motor drive, and constant torque drive; closed-loop control of drives -- current - limit control, closed - loop torque control, closed-loop speed control, closed-loop speed control of multi-motor drives, speed sensing, current sensing, phase-locked loop (PLL) control and closed-loop position control (4 Hrs.)

20 marks

Unit 2

DC motor drivs : Performance of dc motors--shunt and seperately excited motors, series motor, compund motor, universal motor, permanent magnet motors, dc servo motors, moving coil motors -- shell and disc types, and torque motors; starting; braking - regenerative, and dynamic; plugging; transient analysis -- separately excited motor with armature control, starting and dynamic braking, energy losees during transient operations, seperately excited motor with field control; speed control--armature voltage control field flux control, armature resistance control; methods of armature voltage control-when the supply is ac - Ward-Leonard schemes, transformer with taps and an uncontrolled rectifier bridge, controlled rectifiers, when the supply is dc - chopper control, working principles of above methods including single phase, three phase controlled rectifiers, dual converter, and chopper control circuits. 20 marks (10 Hrs.)

Unit 3

Three-phase induction motor drives : three-phase induction motors--analysis and performance, operation with unbalanced source voltages and single-phasing; operation with unbalanced rotor impedances, analysis of induction motor fed from non-sinusoidal voltage supply; starting--star-delta starter, auto-transformer starter, closed circuit transition, reactor starter, soft start using saturable reactor starter, unbalanced starting scheme for soft start, part winding starting, rotor resistance starter; braking -- regenerative, plugging, dynamic--ac, self-excited, and dc, zero sequence braking; transient analysis - starting and plugging; speed control-pole changing, pole amplitude modulation, stator voltage control, variable frequency control from voltage sources - voltage source inverter control, cycloconverter control; variable frequency control from a current source - current source inverter control, eddy current drives, rotor resistance control - conventional methods, static rotor resistance control, slip power recovery-static Scherbius drive, static kramer drive. 20 marks (10 Hrs.)

Unit 4

Single-phase induction motor drives : Speed-torque characteristics of single phase induction motors; starting methods and types of single-phase induction motors-split-phase motors, capacitor-run motors, capacitor-start motors, capacitor-start and capacitor-run motors, shaded pole motor; braking of single-phase induction motors; speed control of single-phase induction motors. (2 Hrs.)

Linear induction motor and its control. Synchronous motor drives : Synchronous motors-permanent magnet (PM) synchronous motors - surface mounted and interior, cylindrical rotor wound field motor, salient pole wound field motor, synchronous reluctance motor, damper winding, hysteresis synchronous motor, inductor machine; operation from fixed frequency supply - starting, pull in, transients due to load disturbances, braking; synchronous motor variable speed drives - variable frequency control - modes - true synchronous or self-controlled modes. (4 Hrs.)

Brushless dc motor, stepper motor and switched reluctance motor drives : brushless dc motors - unipolar, bipolar, speed control and applications; stepper motors - variable reluctance - singlestack, multistack, permanent magnet stepper motor - disc type, hybrid, important features of stepper motors, torque versus stepping rate characteistics, drive circuits for stepper motors-unipolar drive for variable reluctance motors, bipolar drive for permanent magnet and hybrid motors; switched reluctance motor-operation and control requirements. 20 marks (4 Hrs.)

Unit 5

Solar and battery powered drives : solar panels, motors suitable for pump drives, solar powered pump drives ; battery powered vehicles - advantages and disadvantages, motoring operation, regenerative braking operation. (3 Hrs.)

Selection of motor power rating : thermal model of motor for heating and cooling; classes of motor duty; determination of motor rating - continuous duty, fluctuating loads, short time and intermittent duty, dc motor, induction and synchronous motors; frequency of operation of motors subjected to intermittant loads. (4 Hrs.)

Energy conservation in drives : Electrical losses in drive system, measuresment for energy conservation in drives, use of efficient semiconductor converters-replacement of resistance controllers, replacement of eddy current couplings, replacement of Ward-Leonard drives, use of efficient motors, use of variable speed drives, energy efficient operation of drives-duty cycle of motor, operation with overvoltages, quality of motor design, over-sizing of motor; improvement of powrfactor - overexcited synchronous motors, capacitors, static var compensators; using a motor of right rating; improvement of quality of supply; use of single - to three phase semiconductor convertors in rural applications; regular and preventive maintenance of motors, transformers and coupled equipment. 20 marks (3 Hrs.)

References :

1. Fundamentals of Electrical Drives, G.K. Dubey, Narosa Publishing House.
2. A First Course on Electrical Drives, Second edition, S.K. Pillai, New Age International.
3. Electric Drives Concepts and Applications, Vedam Subrahmanyam, Tata McGraw-Hill.

List of Experiments :

1. Control of dc motor using single--phase half--controlled rectifier
2. Control of dc motor using single-phase fully--controlled rectifier.
3. One quadrant chopper control of dc motor. 4. Two quadrant chopper control of dc motor.
5. Speed control of single-phase induction motor using ac voltage regulator.
6. Study of stepper motor drive circuit. 7. Study of solar powered pump drive.

The termwork should include a minimum of four experiments from the above list. The termwork marks will be based on performance in theory and practicals having a weightage of 40% and 60% respectively.

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Term-II (Part-6)

Practical Training/ Special Study/Minor Project

(Common with TE (Electronics, Industrial Electronics, Electronic and Telecommunication Engineering & Computer Engg., Electrical Engg., ~~Instrumentation~~, Mech., & Production Engg.)

Examination scheme :
Termwork : 25 marks

Every student need to complete following requirements for termwork of Practical Training/Special Study/ Minor Project.

Practical training in any industry for a period of minimum two weeks and submit training report certified by personnel manager or works manager or any other higher authority of that industry.

OR

Special study on a recent topic from reported literature and submit a report on it.

OR

One mini theoritical or fabrication project and submit a report on it.

OR

Attend a course of Entrepreneurship Development course conducted by college and submit a report on it.

NOTE:-

1. Practical training is to be undergone in Summer Vacation after S.E. and / or in Winter Vacation after first term of T.E.

2. Report should be typed on A4 size paper and three copies paper bounded are to be prepared, one copy is for the candidate, one for the library and one for the teacher concerned.
