

**Class : Second Year Engineering****2001 ENGINEERING MATHEMATICS III****1.Linear Differential Equations:**

solutions of linear differential equations of order  $n$  with constant coefficients, complementary functions & particular integral. Method of variation of parameters. Equations reducible to linear form (with constant coefficients). Cauchy's linear equations. Lagrange's linear equations. Simultaneous linear equations. Total differential equations. Applications to deflections of beams, electrical circuits, Oscillations of spring (free & forced)

**2.Partial differential equations:**

solutions of partial differential equations by the method of separation of variables.

Applications of partial differential equations to vibrations of stretched string wave equation, one dimensional heat flow, two dimensional heat flow, solution of Laplace equations, Laplace equation in polar coordinates. Transmission lines (with given initial & boundary conditions).

**3. Fourier series & Fourier transform:**

Dirichlet's conditions, expansion of functions as Fourier series. Change of intervals, even & odd functions. Half range Fourier series. Fourier integral transform (only statement). Fourier sine & cosine integrals. Complex form of Fourier integral, Fourier sine & cosine transform

**4.Vector calculus :**

Differentiation of vector radial, transverse, tangential & normal components of velocity & acceleration. Gradient divergence & curl of vector point functions. Vector identities. Irrational & solenoidal fields. Line integral, surface integral. Gauss & Stokes theorem, Green's lemma. Applications to electromagnetic fields & fluid mechanics

**2301 - Electrical Machines & Measurements**

1. D.C. Machines : E.M.F. & torque equation, methods of excitation, magnetization characteristics, self excitation characteristics of D.C. generator, starting & speed control of D.C. motors, application of D.C. generators and motors.
2. Polyphase supply system, voltage current & power in single phase & three phase circuits, three phase transformer connection Star / Star, Star/Delta, Delta/Delta, Delta/Star, V. & Scott connection, Three phase to six connection. (descriptive treatment only).
3. Synchronous Machines : Construction & theory of operation, winding factors, E.M.F. equation, armature reaction, synchronous impedance phasor diagram, V-Curves, synchronous capacitor, starting method
4. Induction Motors : Construction of three phase cage wound rotor motors, principle of operation, torque-slip characteristics, torque expression, single phase induction motor, construction and starting comparison with three phase motor, applications.
5. Electro-mechanical indicating instruments, Principles of operation & application of moving coil & dynamometer type ammeter, voltmeter, Wattmeter, study of ohm-meter energy meter and industrial metering, power factor and frequency meter.
6. A.C. & D.C. bridge, measurement of resistance with bridges Theory of four arm A.C. bridges such as Hay's Kelvin Wheatstone and Wein-bridge use of bridges for measurement of inductance mutual inductance & capacitance, measurement of Q-factor.

**2302 Electronic devices & Circuits-I.**

(One Paper – 3 hours, 100 Marks, Practical 50 Marks )

1. Principles of operation, characteristics, equivalent circuits and parameter of semiconductor devices diode, zener diode, transistor, FET, MOSFET and their specifications, Concept of load line, switching characteristics of transistor, diode, FET and MOSFET, Effect of temperature and frequency.
2. Rectifiers : Half wave, Full wave, Bridge rectifier, Derivation of efficiency, ripple factor and regulation without filter and with capacitor input filter.
3. Biasing : Biasing of transistor and FET, stability factor, Bias compensation, and derivation of stability factor for different circuits.
4. Amplifiers : Hybrid parameters, derivation of voltage gain, current gain, input impedance, output impedance, and power gain, CB, CC, CE configuration and their comparisons. Class A, Class B, Class C and Class AB operations, Their efficiency and comparison. Emitter follower and Darlington emitter follower. Boot strap biasing and collector bootstrapping.
5. Cascaded amplifiers : Direct, RC and transformer coupling their comparison, advantages and disadvantages, Negative feed back voltage and current feedback, series and shunt, effect of feed back, gain stability.
6. Power amplifiers : Class A, Class B and push pull complementary symmetry and quasi complementary symmetry power amplifier, Bootstrapping in complementary symmetry amplifier Bias compensation in power amplifier. Cross over distortion, efficiency and power dissipation.
7. High frequency amplifiers : Hybrid II equivalent circuit  $f_T$ ,  $f_B$ ,  $f_X$ , relationship between  $h$  parameter and hybrid II parameters. Effect of junction capacitances, tuned amplifiers, wide band amplifiers and class C amplifiers.
8. Oscillators : Hartley, colpitts, crystal, phase shift and wien Bridge oscillator, frequency and amplitude stabilization. Use of op amp in wien Bridge oscillator.

### **2303 Network and Lines :**

1. Linear network and lumped elements : Circuit element and sources. Current and node voltage analysis Duality and network theorems. Two port networks, matrix formulation, Inter connection of two port networks, maximum power transfer. Inductively coupled circuits' mutual Inductance.
2. Resonance : Analysis of series and shunt resonance their Q. factor, bandwidth, selectivity : Single tuned and double tuned circuits damping.
3. Interactive networks : Complex propagation constants, phase velocity, phase delay, transmission units, insertion loss transmission loss, Matching networks – Half section and full section reactive matching networks.
4. Wave filters : Theory and design of  $k$  derived and in derived filters, Low pass, high pass, band pass, band stop filters : Composite filters.
5. Theory and design of T, II, and ladder attenuators.
6. Transmission lines : Line of low frequencies, distributed constants, wave equation, voltage and current distribution, distortions, and Loading.
7. Equalizers using R, L, and C, Lattice equalizer, two terminal and double L and T equalizers.
8. R.F. Lines : Short circuited and open circuited lines, resonant lines, quarter wave line, SWR, Single and double stub matching, smith chart and its application.

### **2304. Computer Oriented Numerical Methods.**

1. Computer Arithmetic:

Fixed and Floating Point representation of numbers .Normalized floating point representation. Arithmetic operation such as addition, subtraction, multiplication and division using normalized floating point representation.

Errors associated with digital computers, Inherent errors, Round-off and truncation errors, absolute and relative errors and their significance. Precautions to be taken while executing different arithmetic operations. Error propagation.

2. Non-Linear Equations:

Different methods used for obtaining roots of a non-linear equation such as Bisection, False Position, Newton-Raphson, Secant and Successive Bisection methods, Order of Convergence for Newton-Raphson and secant methods. Comparison of different methods.

3. Solution of linear simultaneous equations:

Solving linear simultaneous equations using Gaussian Elimination, Gauss-Jordan, Matrix inversion and multiplication methods, Gauss-Seidel Iterative methods. Comparison of different methods. Pivotal Condensation and its utility in obtaining more precise results. Condition for convergence in iterative methods.

4. Interpolation:

Lagrangian and difference table interpolation. Forward, Backward and Central differences and their operators. Newton-Gregory forward and backward difference formulae. Gauss central difference formulae. Errors in polynomial interpolation. Error propagation in difference table formulae. Error detection by using difference tables.

5. Regression analysis:

Least square approximation, linear, polynomial, hyperbolic and exponential regression.

6. Numerical differentiation and integration:

Numerical differentiation using difference table formulae. Numerical integration. Newton-Cotes integration formulae such as Trapezoidal rule, Simpson's  $1/3^{\text{rd}}$  rule and Simpson's  $3/8^{\text{th}}$  rule, Romberg's integration for obtaining precise results. Gaussian-Quadrature formulae for single and three points.

Ordinary differential equations:

Classification of different methods for solving initial value problems. Taylor's series method, Picard's method, Euler's method, Runge-Kutta  $2^{\text{nd}}$  and  $4^{\text{th}}$  order method. Error analysis. Predictor-Corrector methods such as Adams-Moulton and Milne's methods.

### **2305 Computer Lab.**

It shall consist of a record on laboratory experiments / studies on the at least 4 experiments each from list 1 and 2.

1. Introduction to DOS 6 xx operation environment ;
  - 1.1 Introduction to file system-file attributes ( Attrib), copy, type, move, end,del, etc.
  - 1.2 Concept of booting – Formatting hard disk and floppy disk, partitioning hard disk. Autoexec bat & configuration file.
  - 1.3 Concept of Internal & External commands- All the External & Internal commands documented in HELP command.
  - 1.4 Batch files – editor (EDIT), batch commands.

### 1.5 Applications – General office automation utilities like wordstar, lotus, database etc.

#### 1. Introduction to UNIX operating environment :

- 2.1. Introduction to file system, file permissions, (owner, group & other).  
Typical Commands (Bourne shell) ls, cd, cp, cat, mv, mkdir, rm, etc.
- 2.2 Unix Utilities- date, cal, banner, calculator, man, wc (word count), tee, >, >>, pg, more etc.
- 2.3 Conceptual introduction to terms multitasking (ps command), multiuser (who commands) operating system, background processes & nohup, kill.
- 2.4 Introduction to concept of shell – Sh, ksh, csh, bash (detailed knowledge to not expected), system variables, LOGNAME, PS2, PB2, TERM, Profile, set vi. Editor etc.
- 2.5 Communication Utilities -Write, talk, mail, mes, (ftp, telnet, etc.)
- 2.6 Compiling & executing programs, in pascal or c ( detailed knowledge programming is NOT expected).

1. Study of electronic development packages such as ORCAD, PSPICE, MATLAB etc.  
The assessment of the Term Work shall be done on the following criterions.

### 2306 Electronic Devices and circuits – II

1. Linear wave shaping , RC low pass and high pass filter, integrator and differentiator, clipping two level clipper clamping.
2. Collector coupled and emitter coupled bistable , methods of triggering , use of commutating capacitors, self biased binary, collector coupled monostable, gate width of monostable, astable.
3. Voltage sweep generator :- Errors in sweep generators, miller integrator, boot strap sweep generator , linearity improvement in boot strap sweep generator , UJT sweep .
4. Current sweep generators , necessity of trapezoidal current sweep generators.
5. Block Schematic of IC555 , its operation as Monostable , astable and timer and other applications.
6. Voltage regulators :- Series and shunt regulators. Derivation of line regulation, load regulation for series regulator, use of darlington pair and constant current source, temperature co-efficient , Block schematic of IC 723 regulator and its application.
7. Differential amplifiers :- Drifts, CMRR, of differential amplifiers , use of constant current Source, cascaded differential amplifier , level shifter, Block schematic of OP amp. Bias compensation and offset balancing.
8. Block diagram of Op-AMP : Study of various stages of OP-AMP Data sheet, study of parameters of OP-AMP and measurement techniques.  
Gain , Band width of Op-Amp frequency compensation techniques , frequency response of compensated and non-compensated Op-Amp.  
Application of op-Amp inverting amplifier non-inverting amplifier voltage follower, V to I and I to V converter, instrumentation amplifier, Bridge amplifier, log amplifier.

### 2007 Engineering Mathematics-IV

1. "Complex Variable" Function of complex variables .  
analysis function, Cauchy- Riemann, equations. Harmonic

functions Orthogonal systems, complex integration, Cauchy Theorem and Cauchy Integral Formula. Taylor's and Laurent's series (with out proof) series of complex terms. Singularities, Residues, Cauchy's Residue theorem, Definite integral of real Functions. Integration along unit circle and along small semi circle, along rectangular contour and contour having pole on real axis. Conformal mapping and bilinear transformations.

2. Laplace Transform and Z-Transform Laplace transform of Elementary functions, shifting theorems, L.T. derivatives and Integrals, Methods of finding inverse Laplace transform . Convolution theorem. L.T. of periodic, unit step and unit impulse functions. Application to the solution of linear differential equations, simultaneous linear differential equations, partial differential equations (when boundary conditions are given). Definition and properties of z-transform, complex z-transform, z-transform of standard sequences, inverse z-transform.
3. Finite differences (forward, backward and central )factorial Polynomial, Difference equations. Solutions of difference Equation Using z-transform.
4. Mean deviation and standard deviation, Quartile deviation Ments skewness and kurtosis. Binomial ,Normal and Poisson Distributions.

## **2206 Instrumentation Techniques :**

1. Classification and general characteristics of transducers, Active and passive transducers, Electrical static and dynamic performance and environmental characteristics, over load and life span.
2. Resistive transducers, LVDT, Hall effect transducer, Thermocouples, Piezoelectric transducers, chemical transducers : pH measurement, Digital transducers, selection criteria for transducers, temperatures, Pressure, level, flow measurement.
3. Electrical conductivity measurement for chemical composition, A.C. electro dynamometer, conductivity cell.
4. Photoelectric transducers and their applications : Photo emissive, Photoconductive and photo voltaic effects, solar cells, phototransistors, avalanche diodes, light actuated p-n-p-n devices, photomultipliers, Applications of photo devices for relay control, illumination stabilization, flame failure devices.
5. Sound Measurements : Sound level meter, microphones pressure – response of capacitor – microphone.
6. Ultra- sonic devices and their application.
7. Block schematic and working principle of single beam CRO – constructional features of CRT – function of different controls – Measurement of phase and frequency. Compensated probe.
8. Recorders, x y plotter and Stripchart recorder.
9. Multimeter : Electronic voltmeters, Digital voltmeters. Digital Multimeter.

## **2307 - Principles of Communication Engineering.**

1. Basic information signals : Nature of signal Analog and digital, their band width in the electromagnetic spectrum. Telegraph signals Single current, double current, simplex and duplex

working, Telephony – Block schematic of strowger automatic exchange, Facsimile, telemetry data transmission.

2. Communication principles : Transmission over wires, Transmission over electromagnetic waves communication channel, multiplexing. Principles of ground wave, sky wave, space wave propagation, study of ionosphere, Modulation – Principles of (AM), (FM), (PM).
3. Characteristics of music, speech and hearing : Loudness tonal quality equal loudness and equal – noisiness contour, basic concepts of room acoustics, sound isolation and sound insulation.
4. Microphones-Construction, sensitivity, frequency response and directional characteristics of carbon, moving coil, ribbon, condenser and crystal, microphones.
5. Loudspeakers-Construction and characteristics of cone and horn type loudspeakers, efficiency, impedance, frequency response mounting cabinets, frequency response mounting cabinets frequency dividing networks.
6. Sound recording and reproduction : Disc recording- Principle, Magnetic recording – Principle, equalisation, biasing and reproduction. Optical recording and reproduction, Hi-Fi, Stereophonic and Quadraphonic systems, Principles of magnetic video recorders & CD Player.
7. Picture Transducers : Construction and principles of Image Orthicon and Vidicon camera tubes, picture tube, scanning, interlaced scanning.
8. P.A. System Block schematics and function of each stages such as preamplifier, tone control, power amplifier, graphic equalizer.

### **2308 - Digital Electronics**

Number systems : Binary, octal, hexadecimal conversion.

1. Binary Addition, Subtraction, one's complement and two complement method. Floating point arithmetic.
2. BCD Code : 8421, excess-3, gray code, parity bit, codes with more than 4 bits, ABSII Code, Hamming code.
3. Revision of Boolean Algebra and I.C. Families. Specifications of logic families and comparison.
4. Minimization of Logic Functions : K-map up to four variable SOP and POS forms, minimization code conversion, Reduction using Quine Mcklesky method.
5. Arithmetic Circuits (Binary parallel adder, 7483 BCD adder, subtract or, Excess-3 adder digital comparator).
6. Multiplexer demultiplexer, decoders, ALU, PRCM, EPROM, PLA, PAL.
7. Sequential Logic Circuits. S-R, clocked S-R and J-K flip-flops, D-Flip, Edge triggered J-K Flip-Flops, Counter (using MS-JK Flip-Flop) – ripple, synchronous, binary, decade, mode N, Pre settable, programmable UP/DN counter IC's.
8. Shift registers : Serial and parallel loading, left shift, right shift, ring and twisted ring shift counter, word generator.
9. A/D and D/A Converters.
10. LED and LCD display devices, specification, comparison, Construction, decoders and drivers for display devices.

### **2309. Electronic Workshop.**

1. Construction specification and testing of different types of resistances, capacitors, coils, transformers and relays, their comparisons and applications.
2. Different types of switches, connectors, cables their construction, specification, testing and comparison and application.
3. Different types of laminates for Printed Circuit Boards their properties and comparison. Single sided, double sided and multiplayer PCB's and their application.