Department of Electronics & Communication Engineering
National Institute of Technology, Srinagar
Outline of the Syllabus for the Admission Test of M. Tech
(Communication & Information Technology and Microelectronics)

(A) Network Analysis and Basic Electric Engineering
Wave form analysis and synthesis:
The unit step, ramp and impulse functions and Laplace transforms. Initial and final value of f(t) from f(s). Convolution integral, convolution as summation,

Network Theorems and impedance functions:
Complex frequency, transform impedance and transform circuits, series and parallel combination of elements.

Network Functions – Poles and Zeros:
Ports or terminal pairs, Network and functions for one port and two port networks (ladder and general networks). Poles and Zeros of network functions, Restriction on Pole and Zero locations for driving point ad transfer functions. Time domain behavior from poles zero plot.

Two port parameters
Relationship of two parameters, Admittance, impedance transmission and hybrid, parameters, Relationship between parameters sets, Parallel connection of two port networks.

Electric Circuit Laws:
Basic Electric circuit terminology, Ohm's law, Kirchoff's current law (KCL) and Kirchoff's voltage law (KVL) Circuit parameters (Resistance, Inductance and capacitance), Series and Parallel combinations of resistance, Inductance and capacitances, Nodal analysis

D.C. Circuit Analysis
Power and energy relations, Analysis of series parallel DC circuits, Delta star Transformation, Loop and Nodal methods. Thevenin's Theorem, Maximum Power Transfer Theorem, Superposition theorem

A.C. Circuit Analysis
Basic terminology and definitions, Phasor and complex number representation, solutions of sinusoidal excited, RC circuits, Power and Energy relations in AC circuits. Applications of network theorems to AC circuits, Resonance in series and parallel circuits

Magnetically Couples Circuits
Mutual inductance, Theory of magnetic circuits and electromagnetism Transformers

(B) Electronic Circuit and Design
Introduction to Semiconductors:
Intrinsic and extrinsic semiconductors, transport mechanism of charge carriers, electric properties, Hall effect etc., Electronic Devices, their characteristics and applications.

PN junction diode
Current components in PN junction, characteristic piece wise linear approximation, temperature dependence, Diode capacitance, and switching times, diode circuits half wave, full wave

rectifiers, clipping circuits etc Basic operation of Zener, avalanche, schottky photo and tunnel diodes

BJT's: Types operation and characteristics, Eber – Moll model, CE, CB and CC configuration input, output characteristics and graphical analysis of basic amplifier circuits, Biasing and Bias stability, Low frequency h – parameter model, Analysis and Design of transistor amplifier circuits using h parameters.   High frequency hybrid – pi model, analysis and design of transistor amplifier circuits at high frequencies. Multistage amplifiers, phototransistors, Transistors as a switch, SCRs and Thyristors

FET's: Operation and characteristics, model application at low and high frequency, amplifiers, switching circuits   MOSFEET TYPES, Operation and characteristics.

Feedback Basic
Negative feed back Effect of negative feedback on the performance of amplifiers e.g., on Bandwidth, Types of feedback amplifiers, current shunt, current series, voltage shunt, and voltage series feedbacks, Analysis of feedback amplifiers circuits

Sinusoidal Oscillators:
Basic operations, analysis of general oscillator circuit, Barkhausen criteria, various types of oscillator circuits and their analysis, Design of practical oscillator circuits.

Power Amplifiers and Power Supplies
Classification of power amplifiers, Class A, Class B, Class AB and Class C power amplifiers, analysis and design power supplies and IC regulators

Operational Amplifiers:
Operational amplifier stages, differential amplifier, CMRR, Cascade amplifier, Ideal and practical operational amplifier characteristics and properties, OP amp applications, inverting and non inverting amplifiers, difference amplifier, summer differentiator, integrator and rectifiers etc. OP ap in analog computation and other applications.

Linear Wave Shaping Circuits and Wave form generators:
RC and RLC Circuits and their response to various wave forms.
Bistable, Monostable and Astable multivibrator circuits, and their analysis, Wave form generators, triangular and square wave generators

(C)   Digital Electronics, Microprocessor and Computer Hardware and Programming

Review of Binary, Octal and hexadecimal number systems. Various types of codes,
Boolean algebra and Boolean theorems
Logic gates and implementation of Boolean functions with various types of logic gates Circuit equivalence.

Simplification techniques and minimization by map methods. Tabular method

Combinational logic circuits: Half adder, full adder, comparators circuits, Encoders and Decoders, Multiplexers and De-multiplexers

Sequential circuits – stage diagrams and state tables, design and analysis of flip flops, registers, counters, Synchronous and Asynchronous operation of sequential circuits. Analog to Digital converter, Digital to Analog Converter

Microprocessor architecture and microprocessor systems (8085/8086)
Introduction to 8085 basic instructions
Programming techniques with additional advanced instructions
Counter and timing delays
Stack and Subroutines
Interrupts
Software development System and Assemblers
Interfacing peripherals (I/O's) and applications
Parallel input/output and interfacing applications.
General purpose programmable peripheral devices
Serial I/O and data communication
16 Bit processors, Introduction to 8086/8088
Introduction to Microcontrollers

(D) Introduction to Computer architecture and organization

Computer Organization and instruction cycle control, CPU Organization, I/O devices and Organization.
Latches and memory organization Types of memories; ROM's EPROM's and RAM's Dynamic and Static. Introduction to PLAs

C language and Data Structure
Problem solving, algorithms, techniques in problems solving, Flow charting, step wise refinement, modularity of programmes, various data types of C, decision making, structure arrays and pointers. Functions, file management etc.

Definition and operation on Array's Stacks, Queues, Lists, Trees, Evaluation of arithmetic expressions, using stacks, recursion and recursive algorithms, List representation, Recursive and non recursive definition of tree structures. Binary trees, Operations using recursive and non recursive algorithms, Forests, Sample Searching and Sorting algorithms, Hashing Techniques

(E) Communication Theory

Spectral Analysis of Signals:
Fourier series of repetitive signals, Fourier transform of non repetitive signals. Amplitude Spectrum of special signals viz., pulse train and pulse wave form.

Modulation
AM,DSB/SC, SSB, VSB, Angle modulation, NBFM, WBFB Diode detector, Frequency discrimination, AM and FM (Block Diagram).

Noise Analysis
Performance of AM and FM Systems, in presence of noise Threshold in AM and FM Demodulation, Pre emphasis, De emphasis in FM Systems

Digital Communication
Sampling, Quantization, Quantization Noise, Coding, Pulse code Modulation, differential PCM, ADPCM, Relative advantages and disadvantages, Delta modulation, PWM and PPM.

Digital Modulation Techniques
ASK, FSK, PSK, M-FSK, DPSK, QAM Schemes.

Data Communication
Data Transmission, data encoding, digital data communication technique, protocol, interface standard.
Error detecting and error correcting technique, nature of transmission errors, error detecting codes, error correcting codes, Retransmission techniques.
Multiplexing and De multiplexing techniques viz, TDM, FDM
Introduction to transmission media and network topologies, MAN, LAN, WAN
Synchronous and Asynchronous networks, carriers, bit and frame synchronization
Circuit Switching, message switching and packet switching, relative advantages and disadvantages
Routing techniques, flooding, static routing, centralized routing, distributed routing.
Multiple access scheme viz., TDMA, FDMA, ALOHA, CSMA Techniques.
Integrated services digital network, broadband ISDN

Transmission Line
The Transmission line general solution, Basic definition, Distortion less line, telephone cables, inductance loading, line not terminated in Zo, reflection; open and short circuited lines, Relflection coefficient, Reflector factor and reflection loss, parameters of open wire and coaxial lines at radio frequency constants of dissipation less line, standing wave ratio, Input Impedance of loss less, open wire and short circuited Co-axial lines or radio frequency. Quarter wave lines as impedance transformer, Half wave and eight wave lines. Impedance matching, The smith diagram and its applications.

Antenna's:
Basic Antenna parameters, elementary doublet, Half wave antenna, vertical antenna above ground, the grounded quarter wave antenna, Directivity and Antenna Gain, Bandwidth and Beamwidth, Radiation Pattern , Folded dipole and applications.   Antenna arrays, Parabolic reflector, properties and feed mechanism, Horn Antenna, Loop Antenna

Propagation of Waves:
Waves in free space,   Attenuation, Absorption and Polarization, effects of environment, ground wave propagation, sky wave propagation, space wave propagation, Troposphere propagation and Extra terrestrial propagation, Fundamentals of Satellite Communication