DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

NITK SURATHKAL, MANGALORE 575025

Important Instruction and Syllabus for M. Tech. (Self-finance) written test -August 2021

Date: August 30, 2021
Day: Monday
Time: 9:00 AM- 10:00 AM

Applicants, please note the following:

A. The test will be conducted on a digital platform (Moodle). For that you have to login into IRIS, IRIS will navigate you to Moodle.
B. It is applicant responsibility to maintain good interactive session in terms of Uninterrupted internet connectivity.
C. Applicants are instructed to join the meeting link to write the test well in advance.
D. Applicants who have applied in the multiple streams (CN, SPML and VLSI) are supposed to appear in a common test only. Thus, when you login into IRIS, you will Find a single navigation option to attempt the common test.
E. Based on written test performance, shortlisted candidates will be called for the interview in the respective streams.

Syllabus

1. **Circuit Analysis:**

Node and mesh analysis, superposition, Thevenin's theorem, Norton's theorem, reciprocity. Sinusoidal steady state analysis: phasors, complex power, maximum power transfer. Time and frequency domain analysis of linear circuits: RL, RC and RLC circuits, solution of network equations using Laplace transform. Linear 2-port network parameters, wye-delta transformation.

2. **Control Systems:**

Basic control system components; Feedback principle; Transfer function; Block diagram representation; Signal flow graph; Transient and steady-state analysis of LTI systems; Frequency response; Routh-Hurwitz and Nyquist stability criteria; Bode and root-locus plots; Lag, lead and lag-lead compensation.

3. **Data Structures and C Programming:**

Programming in C - variables and datatypes, program structures (loops, branches), functions, recursion. Arrays, multidimensional arrays, pointers, structures. Data structures - linked lists, queues, stacks, trees, binary search trees, binary heaps, insertion and deletion from data structures, algorithm complexity of the operations, tree traversal algorithms, applications of data structures. Graphs - representation, traversal - DFS, BFS, shortest path- Dijkstra's algorithm

4. **Linear Algebra:**

System of linear equations - matrix form, Solution of linear equations- Gaussian elimination, LU Decomposition, rank, Existence of solution, uniqueness. Vector space - fundamental properties, subspace and properties, linear dependence and independence, Basis, coordinates, inner product and projection, approximation of vectors to a subspace, eigenvalues and eigenvectors, diagonalization.

5. **Analog Communications:** Amplitude Modulation and Demodulation, Angle Modulation and Demodulation, Communication Receivers, Characterization of System Noise, Noise Performance of Analog Communication Systems.

Information Theory and Coding: Joint and Conditional Entropy, Mutual Information, Source Coding, and Shannon's Channel Capacity Theorem. Fundamentals of Error Correction, Basics of Block Codes, Cyclic Codes, and Convolutional Codes.

Digital Communications: Sampling, Quantization, Time Division Multiplexing, PCM, Linear Prediction, Differential PCM, Delta Modulation, Line Coding Techniques, Pulse Amplitude Modulation, Pulse Shaping, Matched Filter, Vector Space Representation of Signals and Noise, Error Performance of ML and MAP Detectors, Digital Information Transmission Using Carrier Modulation (ASK, FSK, PSK, and QAM), Power Spectral Density and Probability of Error Evaluation for Digitally Modulated Signals, Nyquist's Criterion for Zero ISI, Role of Equalizers in Time Dispersive Channels.

6. **Digital Electronics**

Number systems, Conversion from one system to other
Combinatorial circuits: Boolean algebra, minimization of functions using Boolean identities and Karnaugh map, NAND-NOR realization, half/full adder/subtractor, encoders, multiplexers, decoders, comparators, Parity checker/generator, parallel adders, BCD adder, barrel shifter and ALU
Sequential circuits: latches and flip-flops, counters, shift-registers and finite state machines.

7. **Probability and Random Variables:**

Random variables. Uniform, normal, exponential, Poisson and binomial distributions. Mean, median, mode and standard deviation. Conditional probability and Bayes theorem.

8. **Computer Architecture and Networks:**

Machine instructions and addressing modes. ALU, data-path and control unit. Instruction pipelining, pipeline hazards. Memory hierarchy: cache, main memory and secondary storage; I/O interface (interrupt and DMA mode).

Concept of layering: OSI and TCP/IP Protocol Stacks; Basics of packet, circuit and virtual circuit switching; Data link layer: framing, error detection, Medium Access Control, Ethernet bridging; Routing protocols: shortest path, flooding, distance vector and link state routing; Fragmentation and IP addressing, IPv4,

9. **Signals and systems:**

Continuous-time signals: Fourier series and Fourier transform, sampling theorem and applications.
Discrete time signals – properties; linear time invariant systems, impulse response, convolution, causality and stability. Difference equations.
Transform domain analysis of discrete-time systems -Z Transform, transfer function, poles and zeroes.
Frequency domain analysis of discrete-time systems – Discrete time Fourier series, Discrete time Fourier transform, Discrete Fourier Transform, Basics of FIR and IIR Filters.

10. **Analog Electronics**:

Diode circuits: clipping, clamping and rectifiers. Op-amp circuits: Amplifiers, summers, differentiators, integrators, active filters, Schmitt triggers and Oscillators.