

Electronics & Telecom Engineering (Module II)

Part II

Marks : 10

Codes and Standards

BIS Codes for Electronics & Telecommunications Equipments & Associated Circuits. Guidelines for Telecom Regulatory Authority India(TRAI), Regulation & specification of CCIR/CCIT for voice communication, telephone, telegram, IEE Regulation

Different standards for Radio Transmission for AM,FM & other systems used in Practice. International standard followed for TV,PAL, SECAM, specification of color TV % Monochrome international standard followed for Mobile & Satellite Communication System. Binary Coding Technique. AES/EBU, EIA, ISI standard followed for electronic equipments,

Part III

Compulsory Group

Marks : 10

- i) **Circuits and networks:** Nodal and mesh analysis of linear time invariant (LTI) passive circuit, equivalent circuit, network theorems. Star-delta transformation.
Network graphs: Matrices associated with graphs; incidence, fundamental cut set and fundamental circuit matrices.
- ii) **Signals and noise :** Laplace transforms, Fourier series of continuous time and discrete time functions. Fourier transforms, inverse Fourier transform and their properties. Z transforms and its properties. Sampling theorem. Convolution and correlation function. Sources and different kind of noise. Random process and variables. Probability, probability density function, mathematical representation of noise, Power spectral density, Noise temperature, Noise bandwidth.
- iii) **Electronic devices :** Semiconductor devices, P-N junction, Diode, Zener diodes, BJT, JFET, MOS-FET, MOS capacitors, CMOS, PIN and avalanche photo diodes, LASERS.
Device Technology : Integrated circuit fabrication process, LSI and VLSI technology.
- iv) **Analog Electronic Circuit:** Small signal equivalent circuits of BJT, JFET & MOSFET,. Diode circuits: rectifiers, clipping, clamping, Amplifiers: biasing for BJT, JFET etc. Small signals and large signals analysis, frequency response, input and output impedance. Multistage amplifier, differential, darlington, cascode configurations. Feedback amplifiers. oscillators.

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- v) **Digital Electronics Circuit** : Number system, Boolean algebra, minimization of boolean functions. Logic gates, digital I.C. logic gate families, combinational and sequential logic circuits. ADC and DAC principle and circuit. Semiconductor memories.
- vi) **Different standards in Electronics & Tele-communication Engineering**: Bureau of Indian standard codes for Electronic and Tele-communication equipment, circuits and components, TRAI and its regulations, CCIR/CCITT specification for voice communication, telephone & telegraph, IEEE – regulation for various Tele-communication/electronics components and system, IEEE/CCIR/CCITT – regulations for different transmitters and receiver for voice, data video, multimedia communication, Standards for satellite communication system.

Elective Group

Marks : 40

*(The candidate has to select any **one** group as per his area of specialization)*

Group A : Communication Engineering

- i) **Analog communication**: Different type of analog modulations : AM, FM, PM, and demodulation. Principle of transmitters. Superhetrodyne receivers and their standards. Performance of different types of receivers in terms of output signal to noise ratio.
- ii) **Digital communication system**: Different type of source coding: PCM, DPCM, delta, adaptive delta, Δ modulation. Different type digital modulation- PSK, FSK, ASK, MARY system MSK, GSK. Spread spectrum techniques. Multiplexer – FDM, TDM, CDM, Synchronous and asynchronous multiplexing. Inter symbol interference (ISI), regenerative repeater, equalizer. Computer communication network.
- iii) **Switched communication system**: Elements of telephone system, central switching, switching hierarchy. Strowger, crossbar and electronic switches. Switching matrix . Electronic space division switches, centralized SPC, distributed SPC. Multistage networks. Time division switches. Combination switches. ISDN, B-ISDN. Bureau of Indian Standard codes of Tele-communication equipment.
- iv) **Radio and Television** : Different standards for radio transmission. AM, FM transmission. Stereophonic transmission and reception. International standards for TV System, CCIR, PAL SECAM specification for monochrome and colour television. Transmitter and receiver system. Transmitters and receiver measurements and standardization. Standard and Transmitter link. CCIR/CCITT recommendation for voice, data and other communications.

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- v) **Fiber optic communication:** Passive and active components for fiber optic communication. Different types of optical fiber and their characteristics. Fiber optic transmitter and receivers. Use of WDM technique for high capacities system.
- vi) **Mobile and Satellite Communication :** Standards for mobile and satellite communication. Satellite communication system. Earth station, Satellite . Satellite transponder Link budget, frequency selection criterion. Satellite and earth station antenna. Different types of satellite accessing techniques: FDMA, TDMA, CDMA. Mobile communication: Cellular concepts and standards. GSM, CDMA technics, Standardization and Services, Architecture, radio aspect. Security, protocol model, call flow sequence. Direct enhanced cordless tele-communication. DECT.GSM internetworking. VSAT and Internet.

Group B : Control Engineering

- i) **Analog control system:** Concept of feedback. Typical servo components and transducers, Actuator, Pneumatic controller, Control system performance and specifications: Transient and steady state analysis, stability of systems, Routh Hurwitz, Lyapunov functions.
- ii) **Digital Control System:** Sampling process, representation of discrete system. Aliasing. Z transforms. Mapping S domain to Z domain. Discretization of continuous systems, hold circuits, state variable representation. Time and frequency domain analysis: Controller specification, sample data control system. Digital controllers: State feedback, linear quadratic controller and compensation. Digital controller implementation: effect of finite bits, equalization error, overflow, series, parallel and cascade realization of digital controller.
- iii) **Optimal and Adaptive Control System:** Principle optimum control, performance measure, principle of optimality, concept of dynamic programming, concept of a single function, multiple independent functions, constrained in minimization of functionals, variational approach of optimal control problems, minimum time and minimum control effort problems. Estimation techniques: least mean square , maximum likelihood. Adaptive controller design. Neuro-Fuzzy adaptive control design.
- iv) **Neuro-Fuzzy Control System:** Basics of fuzzy sets: Classical set to fuzzy set, operation of fuzzy set, membership function, extension principle, Fuzzy mathematics, Fuzzy logic and approximate reasoning. Fuzzy logic based control system: its relationship to conventional control systems, Suzzifer, fuzzy rule base, defuzzifier inference engine, stability analysis and applications.

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- v) **Industrial electronics** : Power amplifiers, Inverter circuits, power semiconductor devices: power semiconductor diode, power BJT, power MOSFET, IGBT, SCR, Controller rectifier, voltage regulators, A.C. Voltage controller, U.P.S., switched mode power supply. Electrical drives: starting and speed control of different type of dc/ac motors, open loop and closed loop control of motor speed, elements of computer control electrical drives.
- vi) **Process Control:** Block diagram and model engineering process industry. Control value and transmission line. Dynamics and control of heat exchangers. Level control, flow control. Model of chemical processes engineering, Dynamics and control of distillation column. Stability and control of chemical reactor.

Group C : Electronic Devices

- i) **Electronic Engineering Materials:** Crystalline and amorphous solid, crystal structures. Atomic packing and structure of solids: Closest packing of spheres, packing efficiency, crystal defects. Semiconductors, Insulators, conductors, super conductors, intrinsic and extrinsic semiconductor. P type, Ntype semiconductor. Dielectric and magnetic and thermo electric properties materials.
- ii) **Electronic devices:** Metal-semiconductor junctions, semiconductors-semiconductors junctions. P-N junction and biased junction properties. Degenerate P-N junction Metal-insulator-semiconductor junction. Bipolar junction: transistor action and properties. BJT parameters, junction field effect transistor, JFET parameter, IGFET, MOSFET and its applications. UJT, SCR V-MOS and IGBT characteristics. Switching and high speed semi conductive devices, opto electronic devices – LED, LCD, Solar cells photo diodes, phototransistors, photo sensitive devices.
- iii) **IC Technique:** Concept of integrated circuits: IC process technology. Basic building blocks of I.C, Analog CMOS subcircuits and systems. BI CMOS circuit technique. BI CMOS device and technology.
- iv) **Opto-electronic Devices** : Opto electronic and display devices: photo multiplier tubes, photo conductive and photo voltaic cells. Photodiodes, avalanche photo diodes, photo-darlington and photo FET. LED, Dynamic scattering and field effect LCD. Gas discharge displays, Laser diodes opto electronic couples. CRO as display devices.
- v) **VLSI Design:** MOSFET characteristics, Scaling and small geometry effects, MOS and CMOS inverter – switching properties, combinational MOS Logic circuits, Sequential MOS Logic circuits, dynamic logic circuits.

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Semiconductors memories : ROM circuits, DRAM, SRAM circuits, Low power CMOS logic circuits, BICMOS logic Ckts. Input-output circuits, ESD protection, input and output buffer devices.

- vi) **Monolithic Microwave Integrated Circuits (MMIC) :** Description MMICS. Its processing, performance status, reliability, yield cost. Applications Basic MMIC circuits: Single-Gate FET, Dual Gate FET, Schottky diodes. Microwave amplifiers, on-chip outside chip tuning, special application.

Group D : Microwave Engineering

- i) **Microwave Components:** Frequency spectrum of microwave, Wave guides and its transmission line analogy. Rectangular and circular wave guides.

Resonators, wave guide matching components. Inductive capacitive and resonant windows, Screws, posts etc. Magic Tee, Hybrid Ring, Corners, Bends and Twists, Phase shift, Directional couplers, Microwave filters. Ferrite Devices: Circular, Isolators.

- ii) **Microwave generation & amplification:** cavity and multicavity, Reflex Klystron, magnetrons, TWT amplifiers. Solid state parametric amplifier, Tunnel diode amplifiers and oscillators, Gunn oscillators, IMPATT Devices.

- iii) **Microwave measurements:** Measurement of frequency, impedance and power measurements. VSWR measurement techniques. Noise figure measurement Antenna measurements.

- iv) **Antennas and propagation:** Principle of radiation by antenna. Different types of antenna, radiation pattern of different type of antennas, dipole, loop, monopole, Travelling wave antenna. Antenna arrays: Adaptive and retrodirective arrays, circularly polarized antenna, helical antenna, smart antenna. Broad band antennas and arrays, microstrip antennas.

Propagation: Different type of electromagnetic propagation. Ground wave, sky wave and Ionospheric propagation. Different interference effect. Process in different frequency range. Scattering and absorption in microwave frequencies. Tropospheric scatter, Duct and non standard refraction. Multipath fading.

- v) **Electromagnetic interference and compatibilities :** Causes of electromagnetic interference and its effects in electronic system. Sources of conducted interference and its characteristics. Non functional and

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functional sources. Minimization of conductance interference. Noise source treatment. Sensitive device treatments.

- vi) Monolithic Microwave Integrated Circuits (MMIC) :** Description MMICS. Its processing, performance status, reliability, yield cost. Applications Basic MMIC circuits: Single-Gate FET, Dual Gate FET, Schottky diodes. Microwave amplifiers, on-chip outside chip tuning, special application.