भारतीय सांकेतिक विज्ञान संस्थ हैदराबाद्
भारतीय प्रौद्योगिकी संस्थान हैदराबाद
Indian Institute of Technology Hyderabad

Advertisement No. IITH/2023/NF/15 dated 22.10.2023.

Post Number	Post Name
15.3	**Junior Technician - Biomedical Engineering**

Syllabus for Written Test and/or Skill Test
(These topics are mentioned for illustrative purpose only.)

Electrical Circuits
Voltage and current sources: independent, dependent, ideal and practical; v-i relationships of resistor, inductor, mutual inductor and capacitor; transient analysis of RLC circuits with dc excitation.
Kirchoff's laws, mesh and nodal analysis, superposition, Thevenin, Norton, maximum power transfer and reciprocity theorems.

Signals and Systems
Continuous and Discrete Signal and Systems: Periodic, aperiodic and impulse signals; Laplace, Fourier and z-transforms; transfer function, frequency response of first and second order linear time invariant systems, impulse response of systems; convolution, correlation. Discrete time system: impulse response, frequency response, pulse transfer function; DFT; basics of IIR and FIR filters.
Analog and Digital Electronics Characteristics and applications of diode, Zener diode, BJT and MOSFET; small signal analysis of transistor circuits, feedback amplifiers. Characteristics of operational amplifiers; applications of opamps: difference amplifier, adder, subtractor, integrator, differentiator, instrumentation amplifier, buffer.

Combinational logic circuits, minimization of Boolean functions. IC families:TL and CMOS.

Arithmetic circuits, comparators, Schmitt trigger, multi-vibrators, sequential circuits, flipflops, shift registers, timers and counters; sample-and-hold circuit, multiplexer. Characteristics of ADC and DAC (resolution, quantization, significant bits, conversion/settling time);

Sensors and Bioinstrumentation

Resistive-, capacitive-, inductive-, piezoelectric-, Hall Effect sensors and associated signal conditioning circuits; Optical sources and detectors: LED, Photo-diode, p-i-n and

avalanche photo diode (APD), light dependent resistor and their characteristics; basics of magnetic sensing; Interferometer: applications in metrology; basics of fiber optic sensing. Basics of LASERs, Origin, nature, and types of Biosignals, Principles of sensing physiological parameters, types of transducers and their characteristics, Electrodes for bioelectric signals, Bioelectric signals and their characteristics. Biopotential Amplifiers, Noise and artefacts and their management, Electrical Isolation (optical and electrical) and Safety of Biomedical Instruments. Generation, Acquisition, and signal conditioning and analysis of of biosignals: ECG,EMG, EEG, EOG, Blood ERG, PCG, GSR.

Principles of measuring blood pressure, Core temperature, volume & flow in arteries, veins and tissues – Lung volumes, respiration and cardiac rate.

Medical Image Systems
Physics and Instrumentation of medical images in X-Ray, Ultrasound, CT, MRI, PET, and their characteristics.

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