33– Instrumentation Technology

Department of Instrumentation Technology
Gulbarga University P. G. Centre, Raichur

Syllabus for Ph.D./M.Phil. Degree Entrance Examination
(With effect from 2016-17 and onwards)

Subject: Electronics & Instrumentation

UNIT I: Analog and Digital Electronics
Rectifiers, Filters, voltage regulation, operational amplifiers: Characteristics, Configurations, Precision rectifiers and Instrumentation amplifier, Number system, Logic gates, Boolean algebra, Flip-Flops, Combinational logic circuit, arithmetic operations and circuits, Counters and Shift Registers

UNIT II: Fundamentals of Instrumentation
Functional elements of instrument system, Types of Instruments, Static characteristics of Instrument, Classifications & selection of transducers, Transducers: Temperature, pressure, displacement, strain gauge, opto-electronic transducers, signal conditioners and recorders.

UNIT III: Electrical & Electronic Instrumentation
Permanent-magnet moving coil (PMMC) Galvanometer: PMMC Mechanisms DC Ammeters, DC Voltmeters, DC Ohmmeters Analog & Digital multi-meters, AC meters: Electrodynamometers in power measurements Watt-hour meter Instrument Transformers Electronic voltmeters AC Bridges, AC Voltmeters Analog & Digital frequency meter, Analog & Digital phase meter, Analog & Digital Cathode Ray Oscilloscope, Digital voltmeters, function generator.

UNIT IV: Control Systems
Types of control system: Open-loop and closed-loop, Feedback and its effects, Transfer function, Block Diagram Algebra, Signal Flow graph, Time responses of I & II order system for step input, performance indices, Routh-Hurwitz stability criterion. Roots-Locus Analysis. Polar plots, Bode plots, Nyquist plots, Constant M and N circles. State variables Analysis, state model, State transition matrix, Controllability and observability.

UNIT V: 8086 Microprocessor Architecture & Programming
Introduction to 16-bit Microprocessors, Architecture of 8086, Functional elements and description. Instruction set of 8086, Addressing modes, writing Assembly Language Programs, 8086 Interrupts and Interrupt response, Interfacing: Memory (RAM and EPROM), Programmable Peripherals, A/D & D/A Converters. Applications of microprocessor for stepper motor and temperature control. 'C' Language Programming.

UNIT VI: VLSI/FPGA
Metal-Oxide Semiconductor (MOS) and related VLSI Technology. Basic MOS Transistors. Enhancement and Depletion Mode Transistor actions. CMOS fabrication. VLSI Design process, Inverter delays, Propagation delays, Wiring capacitance. Complex Programmable Logic Devices (CPLD) –Generic CPLD architecture and Generic Logic block, Xilinx XC9500 CPLD family, Field Programmable Gate Arrays (FPGA) – architecture and General structure, Interconnect, Application Specific Integrated Circuits VHDL Description of Combinational logic circuits, Modeling Flip-Flops, Multiplexer, combinational circuits: Adder, Subtractor, Multiplexer, De-multiplexer, Encoder, Decoder, Flip-Flops, Registers, & Counters.

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UNIT VII: Microcontroller/SoC/Embedded Systems

Intel 8051 Microcontroller Architecture, addressing modes, classification of instructions set and programming, Interfacing of memory (RAM & EPROM), Programmable peripherals, A/D & D/A converters, Multiplexed display, LCD module & stepper motor, PIC16C877 architecture, instruction set, addressing modes, memory organization & Programming, generation of PWM waveform, Application of microcontroller PIC16C877 for DC motor speed control Design and development of 8051 based electronic balance, temperature measurement and control system. Cygnal C8051F020 MSP architecture, programming and applications.

UNIT VIII: Scientific/ Analytical/ Process Instrumentation

Colorimeters & Spectrophotometers: Principle and working with a Block diagram, Salient features of individual blocks & Specifications, Types of spectrophotometers Applications of Spectrophotometers for chemical analysis. PH, conductivity, polarograph, NMR, ESR, Mass Spectrometer, PAS, TG, DTA, Chromatography, Electron microscope, Temperature, Pressure, Flow, Force, Humidity, Moisture, Level, and Density measurement systems.

UNIT IX: Biomedical Instrumentation

Biomedical Electrodes and Recorders, Cardiovascular (ECG), Respiratory(EEG), Nervous System and Biotelemetry, X-ray, computer aided tomography and applications, NMR imaging techniques and Applications. Heomodialysis machine. Applications of Ar, He-Ne, Ruby lasers in Biomedical field Medical Ultra sound Biological effects of Ultra sound.

UNIT X: PC/DSP based Instrumentation

A Basic Personal Computer organization, Computer peripherals, I/O memory addressing and decoding techniques, DIOT card, AD-DA card, serial & parallel port interfacing, Role of PC in instrumentation. Application of PC for temperature and liquid level control. PC based AC motor speed control system. Design of PC based UV, Visible, and IR spectrophotometers. Digital Signal Processing: Signals, Systems & signal processing, discrete time Signals, Systems, Types, Advantages of DSP, Z- transform, Digital Filter Design: Analog filters v/s Digital filters. Design of IIR Filters, and Design of FIR filters, Architecture and Programming of TMS320C5X Digital Signal Processor, Interfacing of Codec (A/D and D/A Converters) with TMS320C5X DSP, FIR Digital Filter DSP based lock-in Amplifier.

BOOKS FOR STUDY/ REFERENCE:

1. Linear Integrated Circuits – Sanjay Sharma
2. Digital Systems –Principles & Applications –Ronaldo J Tocci & Meal S. Widmer
3. Instrumentation measurement & analysis –Nakra /Choudhary
4. Control Systems Engineering – Nagrath I. J. & Gopal M.
5. Microprocessor Interfacing – Programming and Hardware – Douglas V. Hall.
6. Digital Design -principles and practices - John F. Wakerly, 3rd Edition, Pearson Education
7. The 8051 Microcontroller: Architecture, Programming and Applications –K. J. Ayala
8. Experiments with Microcontroller - P. Bhaskar & Malakondaiah K.
9. Electronic Instrumentation - H S Kalsi
10. Embedded Systems Architecture, Programming and Design- Raj Kamal
11. Interfacing with IBM PC – Lewis C. Eggebrecht
12. DSP TMS320C5X Architecture, Programming - B. Venkataramani and M. Bhaskar
13. MATLAB – An introduction with Applications – Amos Gilat

Signature with Seal

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