

## Electronics & Instrumentation Engineering

### Syllabus for PhD Qualifying Examination 2016-2017 (June 2017)

#### Part B

| S.No. | Subject                                       | Topics  | Reference   |
|-------|---|---|---|
| 1     | Electronic Circuits                           | <p><b>Analog Electronics:</b> BJT and CMOS circuits and amplifiers, Operational amplifiers: Ideal opamp, practical opamp, inverting configuration, non-inverting configuration, differential configuration, practical opamp parameters, open-loop and closed-loop frequency response, gain-bandwidth product, slew rate, CMRR. Adder, integrators, differentiators, voltage comparators, Schmitt trigger, peak detector</p> <p><b>Digital electronics:</b> Variables and Functions , Inversion, Truth Tables , Logic gates and Networks, Boolean Algebra , Synthesis Using AND ,OR,NOT , NAND and NOR Gates. Design Examples – Karnaugh Map – Strategy for Minimization, Minimization of product of Sums forms, Combinational Circuits Building Blocks – Multiplexers, Decoders – Encoders Code Converters, Arithmetic Comparison Circuits – Flip flop, Registers, Counters</p> | <ol style="list-style-type: none"> <li>1. Adel S. Sedra and Kenneth C. Smith, “Microelectronic Circuits”, Fifth edition, Oxford University Press, 2004.</li> <li>2. Schilling, Belove, “Electronic Circuits”, Third edition, Tata McGraw-Hill, 2006.</li> <li>3. Stephen Brown , Zvonko Vranesic, “Fundamentals of Digital Logic with Verilog Design,” Tata McGraw Hill Publishing Company Limited, Special Indian Edition, 2007</li> </ol> |
| 2     | Transducers, Measurements and Instrumentation | Resistive, Capacitive, Inductive and piezoelectric transducers and their signal conditioning. Measurement of displacement, velocity and acceleration (translational and rotational), force, torque, vibration and shock. Measurement of pressure, flow, temperature and liquid level. Measurement of pH, conductivity, viscosity and humidity. Biomedical instruments, EEG, ECG and EMG. Clinical measurements. Ultrasonic transducers and Ultrasonography. Principles of Computer Assisted Tomography  | <ol style="list-style-type: none"> <li>1. Ernest O. Doebelin, “Measurement Systems Application and Design”, McGraw Hill International Editions, 2006.</li> <li>2. A. K. Sawhney And P. Sawhney, “A Course In Mechanical Measurements And Instrumentation”, Dhanpat Rai, New Delhi, 2001.</li> <li>3. R.S. Khandpur, “Handbook of Biomedical Instrumentation”, Tata</li> </ol>   |

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|   |                                     |  | McGrawhill, New Delhi, 2003   |
| 3 | Control Systems and Process Control | Feedback principles. Signal flow graphs. Transient Response, steady-state-errors. Routh and Nyquist criteria. Bode plot, root loci. Time delay systems. Phase and gain margin. State space representation of systems. Mechanical, hydraulic and pneumatic system components. Synchro pair, servo and step motors. On-off, cascade, P, P-I, P-I-D, feed forward and derivative controller, Fuzzy controllers. | I.J.Nagrath and M.Gopal, "Control Systems Engineering", Wiley Eastern Limited, New Delhi, 2008. |