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| **University of Mumbai** |
| CLASS: B.E. (Electronics Engineering) | Semester - VII |
| **SUBJECT: Filter Design** |
|  | Hours | Marks |
| Evaluation System | Theory Examination | 3 | 100 |
| Practical examination | - | - |
| Oral Examination | - | 25 |
|  | Term Work | - | 25 |
|  | Total |  | 150 |

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| **Module** | **Contents** | **Hours** |
| 1 | **Analog filters**Filter specifications, Introduction to Butterworth Chebyshev, design (Derivation of T.F.), Elliptical filters, Frequency TransformationsLow pass, high pass and band pass active filter realization, infinite gain single amplifier (LP, BP & HP), positive and negative feedback infinite gain single amplifier filters, high order filters. | 10 |
| 2 | **Direct realization methods**Active network elements for direct realization, inductance simulation frequency dependent negative resistors, leapfrog realization techniques, primary resonator block, switched capacitor filters. | 10 |
| 3 | **IIR filter design**IIR filter design methodology, Design of Butterworth and Chebyshev filters using Impulse/step invariant method, matched Z Transform method, Bilinear transform Technique. Spectral transformations Filter design by pole zero placements. | 6 |
| 4 | **FIR filter : Analysis and design**Linear phase FIR filter and its types, FIR filter design using windows and Frequency sampling method, Half Band FIR filter design. | 6 |
| 5 | **Adaptive Filters**Concept of adaptive filter ,MMSE criterion ,LMS and RLS algorithms ,Basic Weiner filter and its applications | 8 |
| 6 | **Multirate Digital signal Processing**Concepts Decimation Interpolation, sampling rate conversion by raional factor, polyphase structures, multistage implementation, applications like subband coding and Quadrature mirror filtering. | 8 |