

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI  
(END SEMESTER EXAMINATION)

CLASS: MTECH  
BRANCH: ECE

SEMESTER : I  
SESSION : MO/18

SUBJECT: EC522 ADVANCED DIGITAL SIGNAL PROCESSING

TIME: 3 HOURS

FULL MARKS: 50

INSTRUCTIONS:

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
  2. Attempt all questions.
  3. The missing data, if any, may be assumed suitably.
  4. Before attempting the question paper, be sure that you have got the correct question paper.
  5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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Q.1(a) Investigate the property of Z-transform to find the inverse Z-transform of the following [5]  
transformed signal and then find  $x(n)$ .

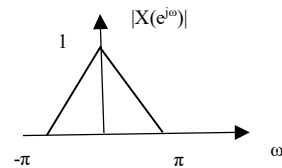
$$X(z) = \log(1 + az^{-1}); \text{ROC } |z| > a$$

Q.1(b) Differentiate between FIR and IIR filters and design FIR filter using window method. [5]

Q.2(a) Define and explain discrete Cosine Transform and investigate its properties in real time [5]  
applications.

Q.2(b) Differentiate between FT and STFT and how they are solved in wavelet transform? [5]

Q.3(a) The spectrum of a discrete time signal is shown in figure. [5]  
Sketch the spectrum of the decimated signal when the signal  
is decimated by a factor of 3.



Q.3(b) Explain the concept of wavelet decomposition & wavelet packet decomposition and implement [5]  
them for 8KHZ signal for three level decomposition.

Q.4(a) State the applications of linear prediction and explain forward linear prediction with required [5]  
diagrams and equations.

Q.4(b) Describe the significance of wiener filters for filtering and prediction with suitable diagram and [5]  
formulae.

Q.5(a) Demonstrate the relation between power spectral density and auto correlation function. [5]

Q.5(b) Compute the periodogram of the signal vector [5]  
(1, 0, 1, 0, 1, 0, 1, 0) and sketch the periodogram.

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