Registration No: | | | | | | | | | | |

Total Number of Pages: 02

M.TECH
P1ECBC05

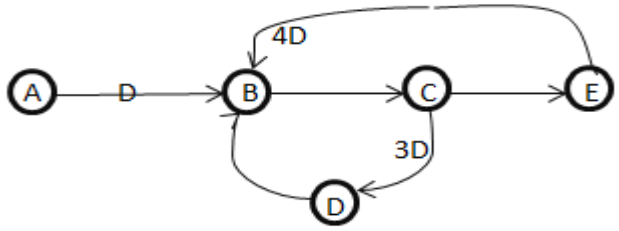
1st Semester Regular Examination 2016-17
ADVANCED TECHNIQUES IN SIGNAL PROCESSING
ELECTRONICS AND COMMUNICATION ENGINEERING

Time: 3 Hours
Max Marks: 100
Q.CODE: Y864

Answer Question No.1 which is compulsory and any FOUR from the rest.
The figures in the right hand margin indicate marks.

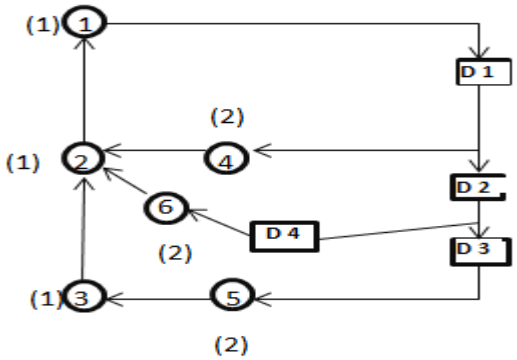
Q1 Answer the following questions: ***Short answer type*** **(2 x 10)**

a) What is MUSIC?
b) What is the difference between SFG and DFG?
c) Find the iteration bound of DFG shown in Fig given below.



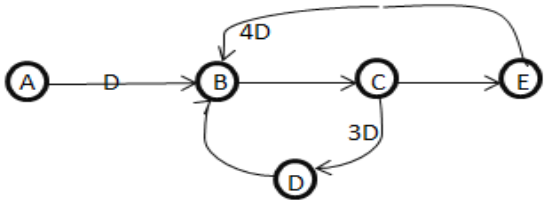
d) What are the advantages of retiming? State two properties of retiming?
e) Draw the 2-level parallel architecture for the 3-tap FIR filter $y(n) = ax(n) + bx(n-1) + cx(n-2)$.
f) Write the nature of biomedical signal?
g) Describe FIR Adaptive Filter?
h) How noise cancellation is done?
i) Give a brief introduction of Wiener Filter?
j) How a signal is represented in time and frequency domain?

Q2 **a)** Compute iteration bound for the DFG, using Longest Path Matrix (LPM) Algorithm. **(14)**



b) What is the difference between pipelining and parallel processing? (Explain with diagrams). Calculate their respective sampling & clock time by taking proper example. **(6)**

Q3 **a)** Unfold the following DFG using unfolding factor 3. **(5)**



b) Solve the system inequalities of M=5, by using shortest path algorithm. **(10)**

$$r_1 - r_2 \leq 1,$$
$$r_3 - r_1 \leq 4,$$
$$r_1 - r_4 \leq -1,$$
$$r_4 - r_3 \leq 2,$$
$$r_3 - r_2 \leq -1$$

c) What is retiming? Write down the application & properties of retiming? **(5)**

Q4 **a)** Explain and derive a comparative discussion/analysis among the adaptive algorithms such as the LMS, NLMS and RLS Algorithms? **(12)**

b) Describe the convergence of LMS Algorithm? **(8)**

Q5 **a)** Explain the cardiac cycle and heart structure with neat diagram? **(10)**

b) Describe ECG with proper block diagram? **(5)**

c) What is EEG? Mention various signals at various frequencies of EEG signal? **(5)**

Q6 **a)** What is Short-Time Fourier Transform? Explain with Example. **(5)**

b) What is spectrogram? Explain Wavelet Signal Decomposition? **(7)**

c) Explain Laplace and z-transform. Find the Laplace transform of cos wt and $\sin^2$ wt. **(8)**

Q7 **(a)** Write short notes on any two: **(2X5)**

i. Discrete Kalman Filter
ii. Phonocardiogram
iii. Power Spectral Density
iv. Eigen decomposition of Autocorrelation Matrix

(b) Write down the spectra; estimation using non-parametric method (Peridogram) and parametric methods (AR, MA and ARMA) spectrum estimation? **(10)**