ME | EXTC | I CBGS. 17|12|14
ES.

QP Code :17451

(REVISED COURSE)
(3 Hours) **[Total Marks : 80**

N.B. (1) Attempt any **four** questions out of **six** questions.
(2) Assume **suitable** data wherever required with justification.
(3) **Figures** to the **right** indicate full marks.

1) For an underground and overhead water tank control system draw the system diagram (minimum system) and data flow diagram. Explain the following factors: a. Operating Frequency, b. Power Supply, c. Computational Technology, d. Bus width, e. I/O lines, f. Peripherals, g. Modes of Processor, h. Type of Software model, i. Task types, j. Need and type of OS, k. Release time, deadline & execution time of tasks. **20**

2) A. Explain the Low power Operation of MSP controller. **10**
B. With an example explain various operating modes of ARM processor. **10**

3) A. Explain qualities of RTOS: a. Performance b. Reliability c. Compactness d. Scalability **10**

B. Explain the following: a. releasing and scheduling time of a task b. hard and firm Real time task c. Aperiodic and sporadic task **10**

4) A. Explain exception mechanism and its application in ARM. **10**

B. Explain ARM Processor architecture variants. **10**

5) A. Write a ARM assembly language program to implement Boolean operation: (W>0) OR ((X>Y) AND (Z=0)) **10**

B. For the tasks set given below find the CPU utilization and verify whether it is schedulable using the RM algorithm. Draw the time space diagram. Assume all the tasks release time t=0. **10**

Tasks (T)	Period of a task (P)	CPU execution time (C)
T1	12	5
T2	7	3

6) Explain any **four** of the following: **20**

a. Digital Signal Processors
b. Embedded networking protocols
c. Hard real-time Vs Firm Real time
d. Co processors in ARM
e. Commercial and Open source RTOS

ME (EXTC) I ( )
RSSPA

QP Code : **17466**

[3 Hours] [Total Marks :80

N.B. : (1) Question No. 1 is **compulsory**.
(2) Attempt any **three** questions from remaining **five** questions.
(3) **Assume** suitable data if required.

1. (a) Explain Clutters and Jamming in Radar Signal Processing. **5**
(b) Give basic Radar Range equation. **5**
(c) Explain Doppler Shift. **5**
(d) Give application of satellite for 3D positioning. **5**

2. (a) If a pulse radar operating with a peak power of 1 MW has the following parameters Pt= 1 MW, PW = 1.2 μs, PRI = 1ms, find Pav, Duty cycle, Rmax. **10**
(b) Elaborate wide Area Differential GPS (WADGPS). **10**

3. (a) Derive Distributed target forms of the range equation. **10**
(b) Write note on Meteosat. **10**

4. (a) Explain Nyquist rate in Doppler using discrete time foruier Transform. **10**
(b) Discuss safety corpas sarsat in detail. **10**

5. (a) Explain Sampling in Fast Time Dimension **10**
(b) Explain signal to Interference Ratio and Integration related to Radar and signal processing. **10**

6 (a) Elaborate basic concept of GPS space segment. **10**
(b) Note on Geo-Eye. **10**

ME (E&TC) Sem II (...) ... Communication
Advanced Satellite
11/12/2014

QP Code : **17442**

(3 Hours) [Total Marks : 80

N.B. (1) Question No. **1** is **compulsory**.
(2) Attempt any **three** from **remaining** questions.
(3) Assume suitable **data** if **necessary**.

1. (a) Why is low bit rate preferred for Telemetry Tracking and Command (TTC) Operations ? **6**
   (b) Why is it necessary to split the received signal into different bands at the satellite and then combine them before transmitting to earth station ? **7**
   (c) Explain why there is only one geostationary orbit. The further away from equator a launching site is less useful it is justify the statement. **7**

2. (a) Explain what is meant by the earth eclipse of an earth-orbiting satellite ? Why is it preferable to operate with a satellite positioned West, rather than East. Explain briefly what is meant by sun transit outrang. **10**
   (b) With the help of block diagram explain telemetry, tracking and command system in satellite communication. **10**

3. (a) Define and explain the term 1-dB compression point. What is the significane of this point in relation to the operating point of a TWT ? Explain why operation near saturation point of a TWTA is to be avoided when multiple carriers are being amplified simultaneously. **10**
   (b) With the aid of a block diagram describe the functioning of transmit receive earth station used for telephone traffic. Describe a multidestination carrier. **10**

4. (a) Explain why does a satellite orbit deviate from the prediction of Keplerr's law. **10**
   (b) A geostationary satellite carriers a C-band transponder which transmits 20 W into an antenna with an on-axis gain of 30 dB. An earth station is in the center of the antenna beam from the satellite, at a distance of 38,000 km. For a frequency of 4 GHz. **10**
      (i) Calculate the incident flux density at the earth station in W/m^2 and dBW/m^2.
      (ii) The earth station has an antenna with a circular aperature 2 m in diameter and an aperature efficiency of 65%. Calculate the received power level in watts and in dBW at the output port.
      (iii) Calculate the on-axis gain of the antenna in dB.

5. (a) Downlink C/N is usually less than uplink C/N, why ? Discuss the system noise temperature and G/T Ratio. What is the importance of these parameters. **10**
   (b) What are varies types of reperaters used in satellite communication ? Explain any one in details. **10**

6. Write short notes on the following :— **20**
   (a) Station Keeping
   (b) Reliability and its significance
   (c) Rain Depolarization
   (d) Different types of Antennas used in satellite communication.

ME Extc (BOS)
MSc

QP Code :17436

(3 Hours) **[Total Marks :80**

Solve any four

Assume suitable data wherever necessary

Q. 1. A. Explain types of simulation model.(10)

Q1 B Use mid square method to generate 10 four digit numbers, taking the seed as 9876. (10 mark)

Q. 2 A. Explain factors which influence simulation of digital system. (10)

Q 2 B. Explain simulation steps of passband signals. (10)

Q3 A. Explain Monte Carlo method. (10)

Q3 B. What are error sources in simulation? (10)

Q 4 A. Solve following integral by Monte Carlo method (10)

$$I = \int_{2}^{5} x^3$$

Q. 4B. Employ arithmetic congruential generator to generate a sequence of 10 random numbers given

R1. =89

R2= 38 and

Modulo m =23 (10)

Q5 A. What are random numbers? Explain properties of random numbers.(10)

Q5 B. Explain overflow issue in simulation. (10)

Q6 A Explain with exampie episodic random process? (10)

Q. 6 B. Determine value of π by employing Monte Carlo method , and using relation(10)

$$Area\ of\ circle = \pi r^2$$

BB-Con.:11308-14.

ME Sem I (CBGS)

Image IVPV

QP Code : 17433

(3 Hours) **[Total Marks : 80**

N.B. (1) Attempt any **four** questions out of **six** questions.
(2) **Assume** suitable **data**.

1. (a) Perform Histogram equalization for the following. Draw the plots for original and equalized image. **10**

Intensity	0	1	2	3	4	5	6	7
No. of Pixel	70	100	40	60	0	80	10	40

(b) State and prove and four properties of 2D DFT. **10**

2. (a) Explain advance methods for edge detection for given image perform image sharpening using Roberts mask. **10**

1	0	4	1
3	4	6	3
2	5	0	4
6	2	5	1

(b) What is signal and discuss the classification of 2D-system. **10**

3. (a) Draw the model for image degradiation process and explain various noise model based on probability distribution of function. **10**
(b) Explain weiner filtering in detail and apply median filter on the given image **10**

2	1	3	4	5
1	1	0	2	3
2	0	0	1	2
5	1	2	3	1
4	3	1	2	0

4. (a) Explain the JPEG encoder and decoder for lossy image compression. **10**
(b) Find entropy of image **10**

20	0	20	0
40	0	40	0
0	20	0	20
0	40	0	40

Proove entropy is maximum when symbols are equiprobable.

5. (a) Explain H. 264 Video compression scheme. 10
   (b) Explain concept of optical flow for motion estimation. Discuss forward and backward motion estimation. 10

6. Write short notes on any **four** of the following :— 20
   (a) Discrete wavelet transform
   (b) Thresholding and grey level slicing of images
   (c) RGB and HSV color model
   (d) Video over IP
   (e) Scalable video coding.

QP Code : **17439**

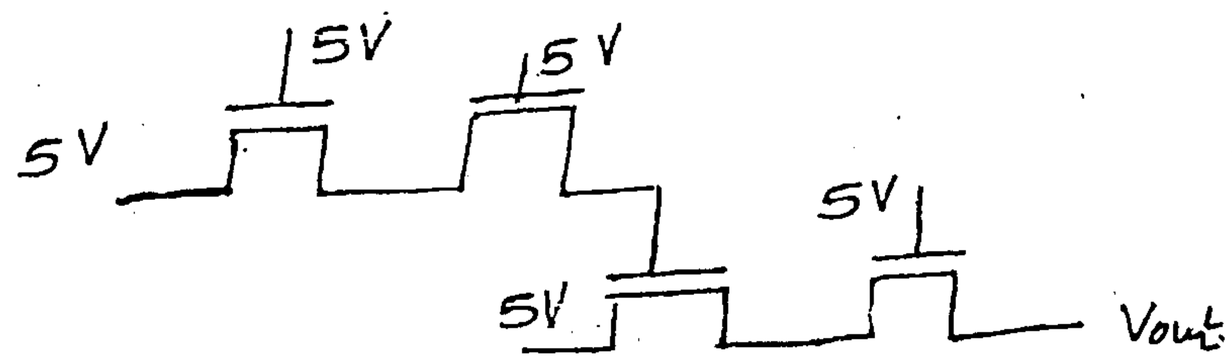
(3 Hours) **[Total Marks : 80**

N. B. : (1) Solve any **four** from **six** questions.
(2) Assume the suitable data, if required and mention the same in the answerbook.
(3) **Figures** to the **right** indicate **full** marks.

1. Solve any **four** :– **20**

(a) Compare system on Board, system-on-chip and system-in-package.

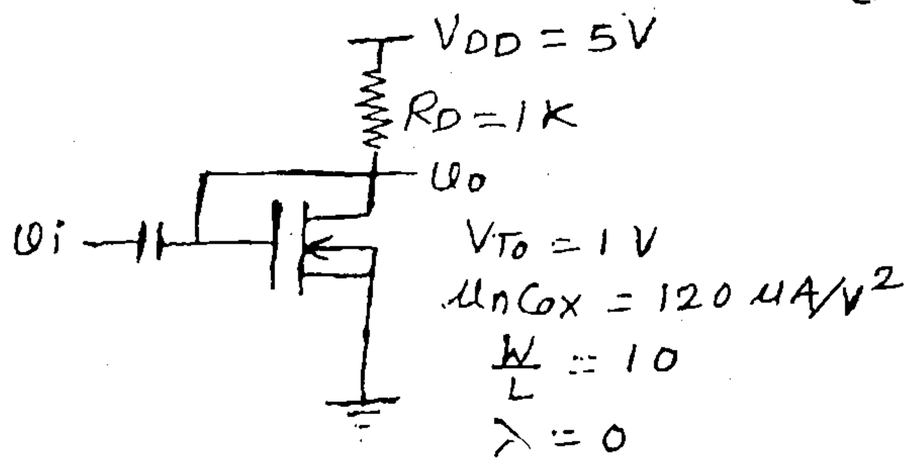
(b) Find o/p voltage for the ckt show below



For all transistor V_{TN} = 1V. Neglect-body bias effect.

(c) What are the different problems associated with MOS switch. What are techniques to overcome same.

(d) For the circuit shown below find small signal voltage gain Av.



(e) What are the advantages and disadvantages of dynamic logic over standard CMOS logic.

2. (a) With the help of transistorised circuit diagram and appropriate waveforms, explain working of CMOS-D latch and edge-triggred flip-flop. **10**

(b) Calculate V_{OL}, V_{OH}, V_{IL}, V_{IH}, N_{ML} and N_{MH} for a two input NOR gate fabricated with CMOS technology with following parameters **10**

$\left(\frac{W}{L}\right)_n = 4$, $\left(\frac{W}{L}\right)_P = 1$, V_{Tn}, = 0.7 V, $V_{TP} = -0.7V$

$\mu ncox = 40\ \mu A/V^2$, $\mu pcox = 20\mu A/V^2$ $V_{DD} = 5V$.

3. (a) What are different types of MOSFET scaling. Explain the impact of each on area, power, power density and delay with the help of necessary equation. **10**

[TURN OVER

(b) Explain various power management and packaging related problems in AMS design. **10**

4. (a) Design the current-mirror load differential amplifier to satisfy the following specifications. **15**

$SR \geq 20$ V/μs with $C_L = 2.5$ PF

$f_{-3dB} \geq 10$ KHz with $C_L = 2.5$PF

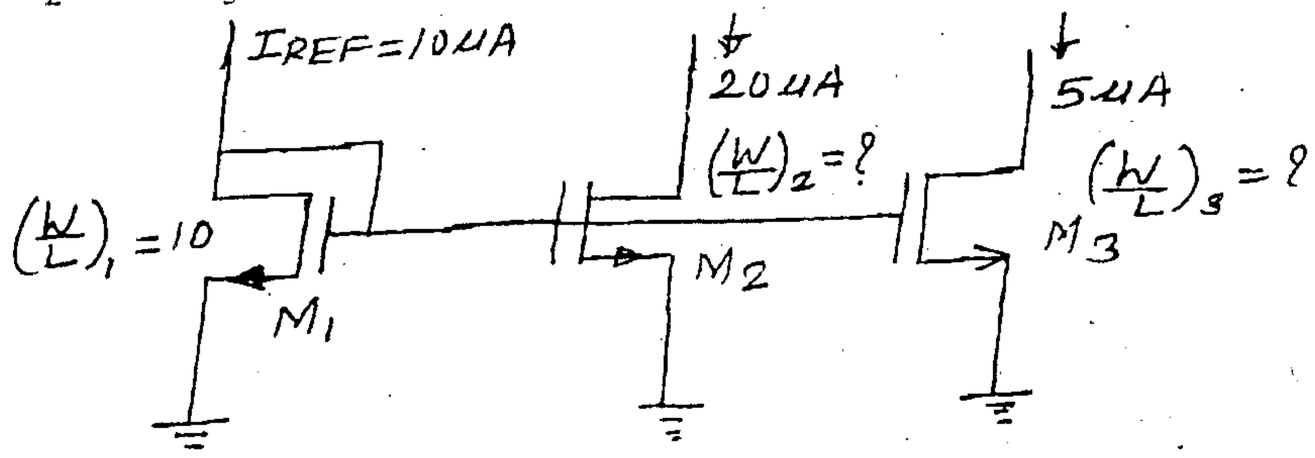
Use, transistors with model parameters

$K_N = 120\ \mu A/V^2$, $KP' = 60\ \mu A/V^2$, $V_{TN} = 0.7V$,

$V_{TP} = -0.7V$, $\lambda_N = 0.04V^{-1}$ and $\lambda p = 0.05\ V^{-1}$

(b) For the simple current mirror shown below, Find $\left(\frac{W}{L}\right)_2$ and $\left(\frac{W}{L}\right)_3$ of transistor **5**

M_2 and M_3 respectively



Threshold voltage and transconductance of all transistors is same.

5. (a) For the two stage OTA os shown below, Find. **12**

(i) Overall small signal voltage gain $\frac{v_o}{v_{in}}$

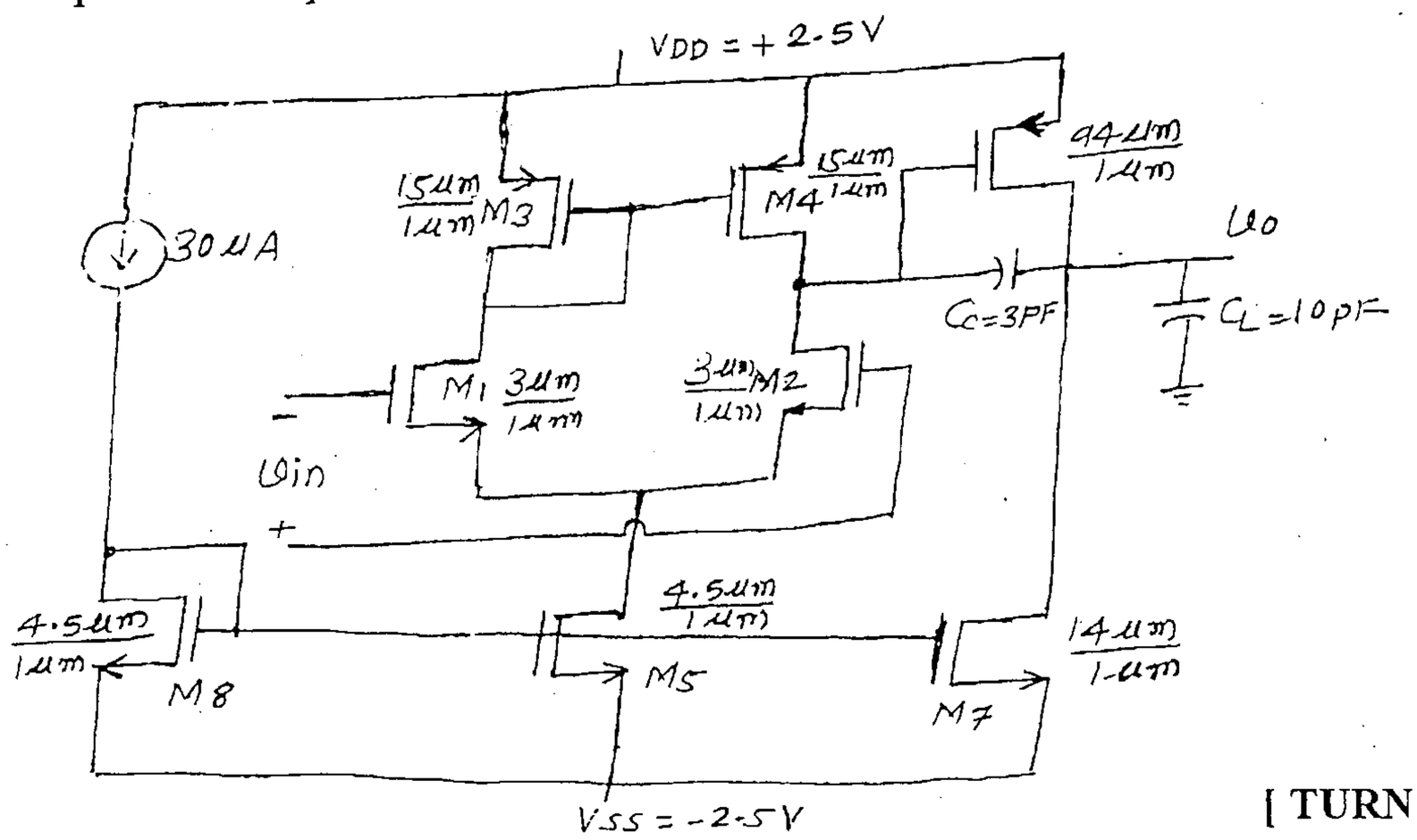
(ii) Output resistance Rout

(iii) The dominant pole P_1

(iv) The unity gain bandwidth GB

(v) Slew Rate (SR)

(vi) DC power dissipation Pdiss



[TURN OVER

Transistor model parameters are
$K_N^1 = 110\ \mu A/V^2$, $K_P^1 = 50\ \mu A/V^2$, $V_{TN} = 0.7V$,
$V_{TP} = -0.7V$, $\lambda_n = 0.04V^{-1}$, $\lambda p = 0.05\ V^{-1}$.

(b) Explain working of charged pump PLL. 8

6. Write short notes on any **four** :– 20
(i) Analog layout techniques
(ii) Power reduction techniques
(iii) Transmission Gate Logic
(iv) Switch Capacitor Circuits
(v) MOS device models

M.E. Extc sem I (CBGS) 5/12/14.
DSP & Applns.

QP Code : 17431

(3 Hours) **[Total Marks : 80**

N.B. : (1) Attempt any **four** questions
(2) Assume **suitable** data wherever **necessary**, justify the **same**.
(3) **Figures** to the **right** indicate **full** marks.

1. (a) What is the need for multirate signal processing ? Give one example of multirate digital system. **4**
(b) Explain in brief real time DSP system. **4**
(c) List limitation of non-parametric method for power spectrum estimation. **4**
(d) Why is a filter required for an interpolator ? Draw the spectrum at the output of interpolator and after filter. **4**
(e) A digital system is characterized by the difference equation shown below with x(n) = 0 and initial condition y(–1) = 12. Determine the dead band of the system. **4**

$$y(n) = 0{\cdot}9y(n-1) + x(n).$$

2. (a) Use split-radix DIT-FFT to evaluate the DFT values for x(n) = {1 2 3 4 5 6}. **8**
(b) Implement efficient two stage decomposition of a system with transfer function. **6**

$$H(z) = 1 + 4z^{-1} - 3z^{-2} + 6z^{-3} - 9z^{-4} + 5z^{-5} + 7z^{-6}.$$

(c) Explain very long instruction word (VLIW) architecture used for P-DSPs. **6**

3. (a) Design a low pass filter using hamming window for the following specification :– **10**

Cut off frequency = 500 Hz
Sampling frequency = 4000 Hz
Impulse response duration = 2·5 ms

$$\left\{ W_{Hamm} = 0{\cdot}54 - 0{\cdot}46 \cos\left(\frac{2\pi n}{N-1}\right) \quad 0 \le n \le N\text{-}1 \right\}$$
$$= 0 \qquad \text{otherwise}$$

(b) Design a Butterworth filter using the Bilinear Transformation technique for the following specifications :– **10**

$$0{\cdot}8 \le \left|H(e^{j\omega})\right| \le 1 \qquad 0 \le \omega \le 0{\cdot}2\pi$$
$$\left|H(e^{j\omega})\right| \le 0{\cdot}2 \qquad 0{\cdot}6\pi \le \omega \le \pi$$

[TURN OVER

4. (a) For the system shown in **figure A**, show that output $Y(e^{j\omega})$ can be expressed as a sum of 'D' uniformly shifted and streched versions of $X(e^{j\omega})$, scaled by a factor I/D. **10**

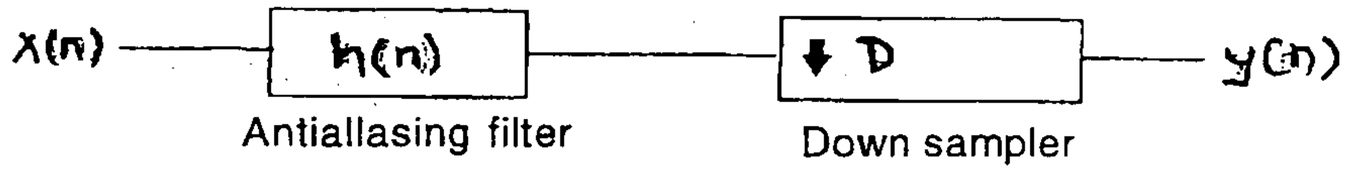


Fig A

(b) The spectrum of discrete time signal is as shown in **figure B**. Sketch the spectrum of **10**

(i) Decimated signal without aliasing for D = 3

(ii) Upsamled or Interpolated signal for L = 3

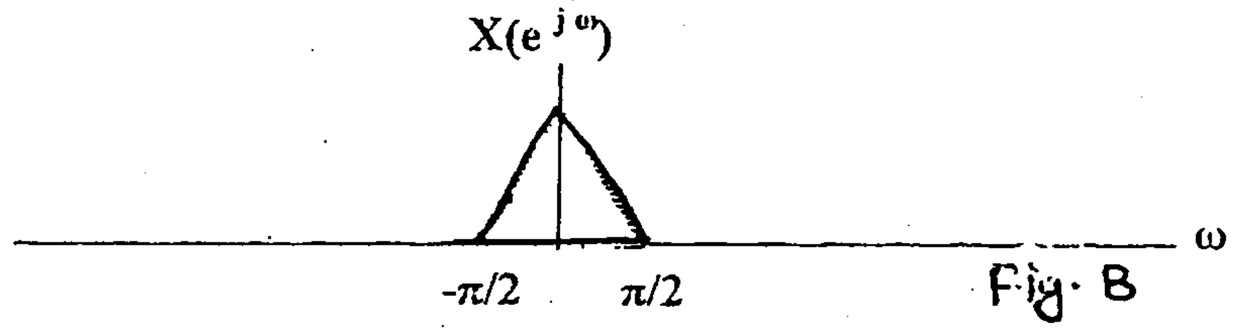


Fig. B

5. (a) Discuss power spectrum estimation using Bartlett method. **10**

(b) Discuss application of DSP in **10**

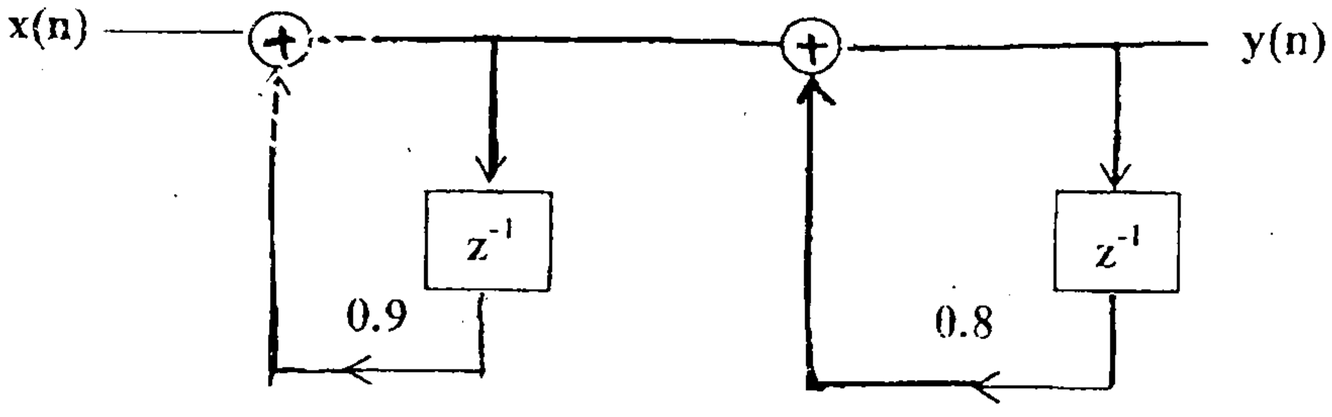
(i) Speech processing

(ii) Biomedical signal processing.

6. (a) Compare any three non-parametric method for power spectral estimation in terms of mean, variance, quality factor, frequency resolution and computational requirement. **10**

(b) A cascade realisation of the two first order digital filter is shown below. The system functions of the individual sections are – **10**

$$H_1(z) = \frac{1}{1 - 0{\cdot}9\, z^{-1}} \text{ and } H_2(z) = \frac{1}{1 - 0{\cdot}8\, z^{-1}}$$



Draw product quantisation noise model of the system and determine the overall output noise power.

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EXTC I CBGS

2014.

Digital signal processing
DSP.

QP Code :17460

(3 Hours) | **Total Marks : 80**

N.B. : (1) Solve any **four** questions.
(2) **Assume** suitable data if **necessary.**
(3) **Figure** to the right indicates **full** marks.

1. (a) Write the properties of DFT and prove the linearity property. **5**
(b) Obtain the polyphase decomposition of IIR system with transfer function **5**

$$H(z)=\frac{1-4z^{-1}}{1+5z^{-1}}$$

5
(c) Write a short note on signal quality. **5**
(d) What are the applications in subband coding.

2. (a) What are the design techniques for FIR filters. Explain frequency sampling method. **10**
(b) The desired response of a low pass filter is, **10**

$$H_d(e^{jw})=\begin{cases} e^{-j3w} & -3\pi/4 \le \omega \le 3\pi/4 \\ o & 3\pi/4 < |\omega| \le \pi \end{cases}$$

Determine $H(e^{jw})$ for M=7 using a Hamming window.

3. (a) Convert the analog filter into a digital filter whose system function is, **10**

$$H(s)=\frac{s+0.2}{(s+0.2)^2+9}$$

Use the impulse invarint technique. Assume T=1s.
(b) Draw the structures of cascade and parallel realizations of **10**

$$H(z)=\frac{(1-z^{-1})^3}{\left(1-\frac{1}{2}z^{-1}\right)\left(i-\frac{1}{8}z^{-1}\right)}$$

4. (a) Given x(n) = {1,2,3,4,4,3,2,1}, Find X(K) using DIT FFT algorithm. **10**
(b) What is frequency transformation? explain in detail. **10**

5. (a) Explain the basic structure of sampling rate conversion. **10**
(b) Develop a direct form I realsation of the difference equation. **10**

$$y(n) = b_0\, x(n) + b_1\, (n-1) + b_2\, x(n-2) + b_3\, x(n-3) - a_1\, y(n-1) - a_2\, y(n-2) - a_3\, y(n-3)$$

6. (a) Explain Lagrange interpolation and spline interpolation. **10**
(b) What is Karhunen- Loeve transform? **10**

ME EXTC Sem I (CBGS) 25/11/14.
SSA

QP Code : 17425

(3 Hours) **[Total Marks : 80**

N.B. : (1) Attempt any **four** questions out of **six**.
(2) **All** questions carry **equal** marks.
(3) Assume **suitable** data, if **required** and state it **clearly**.

1. (a) The events *A* and *B* are mutually exclusive .Can they be independent ? Explain. **5**
(b) Define pdf of continuous random variable and state its properties. **5**
(c) Consider a Process Y(t), which consists of desired signal X(t) plus noise N(t). Find cross correlation of Y(t) assuming that X(t) and N(t) are independent random process. **5**
(d) Explain M/M/1 Queueing system. **5**

2. (a) Prove that the output of a white noise process through an LTI system represents a Colored noise process. **10**
(b) Define first and Second order distribution and density function of Random Process. Show that the process x(t) = A cosωt + B sinωt, where A and B are Random variables is Wide Sense Stationary, if **10**
(i) E(A) = E(B) = 0, (ii) $E(A^2) = E(B^2) = 0$, (iii) E(AB) = 0.

3. (a) Find the state probabilities for the Poisson process. **10**
(b) State and develop Little's Formula for a queueing system. **10**

4. (a) What is Mean and Autocorrelation Ergodic Random Process ? Prove that Random Telegraph process is mean Ergodic. **10**
(b) Define Independence ofRandom Variables. **10**
Given –

$$F_{XY}(x,y) = \begin{cases} xy^2 e^{-y}, & 0<y<\infty,\ 0<x<1, \\ 0, & \text{otherwise.} \end{cases}$$

Determine whether *X* and *Y* are independent.

5. (a) Find the Transfer function for the optimum filter for estimating Z(t) from $X(\alpha) = Z(\alpha) + N(\alpha)$, $\alpha \in (-\infty,\infty)$, where $Z(\alpha)$ and $N(\alpha)$ are independent, zero-mean random process. **10**
(b) Let X_n be an iid (Independent and identically distributed) random Process. Show that X_n is a Markov process and give it's One - step Transition Probability Matrix. **10**

6. Write Short notes on the following :– **20**
(a) Special Probability Distributions
(b) Kalman Filter.
(c) Central Limit Therom.
(d) Multi – Server systems.

BB-Con.:7944-14. *********

ME/Extn/I CBGS.

OFC

QP Code : 17427

(3 Hours) **[Total Marks : 80**

N.B. :(1) Question No.**1** is **Compulsory.**
(2) Attempt any **three** out of **five** questions.
(3) Assume suitable data wherever necessary and justify the same.

Q 1 (a) Explain dispersion in optical fiber communication. **05**

(b) Explain the method to mitigate the effect of FWM in optical fiber communication. **05**

(c) What are the different types of nonlinearities in optics. **05**

(d) Describe properties of Solitons. **05**

Q 2 (a) State and compare self and cross phase modulation. **10**

(b) Explain SONET **10**

Q 3 (a) Modulator designed with lithium niobate operating at wavelength of 1.3 μm is 2 cm long with a distance between electrode is 25 μm. Determine the voltage required to provide a phase change of π radians. Electro optic coefficient of lithium Niobate is 30.8×10^{-12} mv $^{-2}$ and refractive index is 2.1 at 1.3 μm. **10**

(b) Describe in detail Optical modulator. **10**

Q 4 (a) Compare three types of optical amplifiers. **10**

(b) Explain frequency chirping in detail. **10**

Q 5 (a) Describe scattering in non-linear optics with suitable example. **10**

(b) Explain any one optical fiber network topology. **10**

Q 6 Write short notes on any **three** **20**

A. Optical Multiplexer

B. Optical MEMS

C. Optical Switch

D. Optical Computing