

This question paper contains 2 printed pages.

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Your Roll No.....

MECTA  
Paper – CS.502  
**BASICS OF ELECTRONICS AND  
COMMUNICATION ENGG.**

J

Time : 3 hours

Maximum Marks : 100

(Write your Roll No. on the top immediately on receipt of this question paper)  
Attempt any five questions. All questions carry equal marks.

Q1.(a) Design a synchronous counter using T flip-flops that counts the following sequence  
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Q1.(b) Explain in detail with diagram the operation of Differentiator and Integrator using  
OP- AMP. (10+10)

Q2.(a) Design a BCD up-counter using negative edge triggered J-K flip-flops.

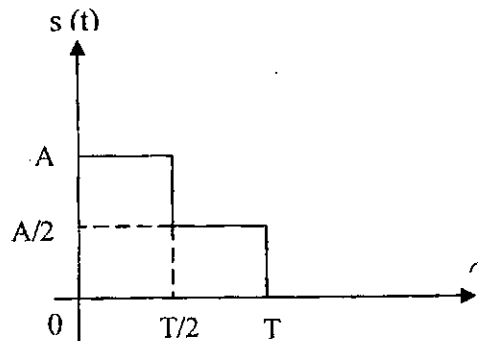
Q2.(b) Draw and explain the block diagram of a superhetrodyne receiver. What are the  
advantages and disadvantages of a superhetrodyne receiver over TRF receiver. (10+10)

Q3.(a) What is Quantization Error. Derive an expression for the signal to noise ratio in dB for  
quantization Error in PCM.

Q3.(b) In the compact disk (CD) digital audio system , an analog signal is digitized so that the  
ratio of the peak-signal power to the peak quantization noise power is at least 96 dB. The  
sampling rate is 44.1 kilosamples /sec.

- (i) How many quantization levels of the analog signal are needed for  $(S/N_{qe})_{peak} = 96$  dB.
- (ii) How many bits per samples are needed for the number of levels found in part (i).
- (iii) What is the data rate in bits/sec. (10+10)

Q4. A signal  $s(t)$  of duration T secs along with noise (white Gaussian noise with P.S.D.  $N_0/2$   
watts /Hz) has entered into a two port network with impulse response  $h(t)$ . The purpose of the  
network is to maximize the signal to noise ratio at time T secs. Derive the expression for  $h(t)$  if  
 $s(t)$  is given by



Draw the output waveform of the network.

(20)

Q5. (a) Explain with the help of a neat diagram the generation and detection of DPCM signal. Explain prediction gain.

Q5. (b) Explain with the help of block diagram the generation and detection of DM waves. What are the different types of error occur in Delta modulator and how can they be minimized.

(10+10)

Q6. For a PCM wave '1' is represented by a pulse of duration  $T$  secs and amplitude  $A$  volts. The symbol '0' is represented by absence of pulse and symbol duration is  $T$  secs. The signal is transmitted through an AWGN channel with noise p.s.d.  $N_0/2$  watts/Hz. Assuming decision threshold at  $A/2$  volts, determine the probability of error in detection the signal. (20)

Q7.(a) Explain in detail with mathematical expression and output waveforms of the following modulation techniques.

- i) BASK
- ii) BPSK
- iii) BFSK
- iv) QPSK

Q7.(b) Find the probability of error in binary phase shift keying (BPSK) in terms of energy of the signal  $s(t)$ . (10+10)