

- N. B. :** (1) Question No. 1 is **compulsory**.  
 (2) Answer any **four** questions out of remaining **six** questions.  
 (3) Assume **suitable** data if **required**.

1. (a) What is companding ? Explain A-law and  $\mu$ -law. 7  
 (b) Explain Adaptive delta modulation in detail. 7  
 (c) Write short note on random process. 6
  
2. (a) Consider the analog signal 5  

$$x(t) = 3 \cos 50 \pi t + 10 \sin 300 \pi t - \cos 100 \pi t$$
 What is the Nyquist rate for this signal ?  
 (b) Explain "Noise triangle" in FM. Hence, explain the role of pre-emphasis and deemphasis circuit in an FM system. 8  
 (c) Draw block diagram of double conversion AM receiver. Explain its working also explain advantages and disadvantages. 7
  
3. (a) State and explain the differences between QASK and QPSK systems giving corresponding expressions and signal space representations. 10  
 (b) With the help of block diagram and waveforms, explain DPSK modulation scheme. 10
  
4. (a) Explain the phase continuity and orthogonality property of MSK signal. 10  
 (b) Write the principle and working of Direct sequence spread spectrum technique system. Explain the comparison of fast hopping spread spectrum and slow hopping spread spectrum. 10
  
5. (a) Draw the block diagram of duo-binary partial response signaling and explain its working. 10  
 (b) Compare :— 10  
     (a) BPSK and QPSK  
     (b) Coherent detection and Noncoherent detection.
  
6. (a) Explain integrate and dump receiver / filter. Derive the expression for signal to noise ratio of the filter. 10  
 (b) Represent the data 10110100 using the following digital data formats with the help of neat figures. 10  
     (i) Unipolar RZ  
     (ii) Unipolar NRZ  
     (iii) Split phase Manchester  
     (iv) M-ary system where  $M=4$ .
  
7. Write short notes on (any **four**) :— 20  
     (a) Central Limit Theorem  
     (b) Transponder  
     (c) Multiple access techniques  
     (d) Equalizer  
     (e) Correlator.