6th Semester Regular / Back Examination 2016-17
DIGITAL COMMUNICATION TECHNIQUES
BRANCH(S): CSE, IT, ITE
Time: 3 Hours
Max Marks: 70
Q.CODE: Z873
Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1   **Answer the following questions:**   **(2 x 10)**
  a) What is the need of an anti aliasing filter?
  b) Explain the role of a sample and hold circuit. Give a diagram.
  c) What is Scrambling?
  d) What is Delta Modulation and give the comparison between DM and PCM.
  e) Draw the geometrical representation of MSK signal?
  f) What is the meaning of orthogonality and orthonormality?
  g) Why QPSK is preferred over BPSK?
  h) Write down the difference(s) between thermal noise and white noise. Give the PSD of each.
  i) What is the relation between information content measured in nats and in bits?
  j) What do you mean by Entropy and write down its mathematical expression.

Q2 **a)** Explain Sampling theorem.   **(2)**
     b) Explain signal reconstruction from uniform samples. Find the Nyquist rate   **(8)**
          and the Nyquist interval for the given signal
          $x(t) = \dfrac{1}{2\pi}\cos(4000\pi t).\cos(1000\pi t)$?

Q3 **a)** Explain PCM system with the help of neat block diagram.   **(5)**
     b) The bandwidth of an input signal to the PCM system is restricted to   **(5)**
          4KHz. The input signal varies in amplitude from -3.8V to +3.8V and has
          the average power of 30mW. The required SNR is given as 20dB and the
          PCM modulator produces binary output. Assuming uniform quantization,

          (i) find the number of bits required per sample, (ii) outputs of 30 such
          PCM coders are time multiplexed. What would be the minimum required
          transmission bandwidth?

Q4 a) Explain in detail with mathematical expressions about power spectra of BFSK signal and also plot it. **(5)**

b) What is minimum in MSK? Explain generation and reception of MSK signals. **(5)**

Q5 a) With the help of neat block diagram explain the principle of adaptive delta modulation. **(5)**

b) Given a sine wave of frequency f_m and amplitude A_m applied to a delta modulator having step size Δ. Show that the slope overload distortion will occur if $A_m > \dfrac{\Delta}{2\pi f_m T_S}$, where T_S is the sampling interval. **(5)**

Q6 a) What is matched filter and find out its probability of error. **(5)**

b) Explain the Nyquist criteria for zero ISI. **(5)**

Q7 Verify the following expression: **(10)**

$0 \le H(X) \le Log_2 m$, where 'm' is the size of the alphabet of X?

x_i	x_1	x_2	x_3	x_4	x_5	x_6
$p(x_i)$	0.3	0.25	0.2	0.12	0.08	0.05

For the given messages and with their probabilities, find out its Huffmann coding.

Q8 **Write short answer on any TWO:** **(5 x 2)**
a) Eye Diagram
b) Differential PCM
c) Minimum shift Keying
d) Companding