



Digital Communication (1030)

P. Pages : 2

Time : Three Hours

Max. Marks : 100

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with blue ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Assume suitable data if necessary.
5. Draw neat diagram wherever necessary.
6. Use of non programmable calculators is allowed.

1. Solve **any two**.

- a) State and prove parseval's theorem. **10**
- b) Prove multiplication property of Fourier transform. Find Fourier transform of $x(t)=A$ for $-\frac{T}{2} \leq t \leq \frac{T}{2}$
= 0 else were **10**
- c) If a band limited signal $x(t)$ is sampled through Natural sampling then show that the resultant spectrum is given by. **10**
$$S(f) = \frac{ZA}{T_s} \sum_{n=-\infty}^{\infty} \text{Sinc}(nf_s z) X(f - nfs)$$

2. Solve **any two**.

- a) Explain Gaussian & uniform distribution. **10**
- b) There are two identical boxes X & Y. Box X contains 4 white & 3 red balls Box Y contains 3 white & 7 red balls one ball is drawn at random from a box. If ball is white what is the probability that it is drawn from box x. **10**

- c) i) Define – 5
- a) Ensemble & Time average.
- b) Stationary & Ergodic process.
- ii) The voltage $v(t)$ is a Gaussian ergodic random process. 5
 It's mean value is zero & variance is 4 volts². $v(t)$ is measured by DC & True RMS meter find the output of both meter.
- 3. Solve any two.**
- a) Explain pulse code modulation. A TV signal with $W = 4.2$ MHz is transmitted using PCM, the quantization level is 512. Find number of bits, bit rate, Bandwidth & SNR. 10
- b) i) Explain LPC speech synthesis. 10
 ii) Explain Eye diagram.
- c) Draw at least five line codes for the sequence 101101. 10
- 4. Solve any two.**
- a) Explain BPSK Transmitter & receiver with necessary waveform, signal space representation & derivation of recovery. 10
- b) Explain BFSK Transmitter & receiver with necessary waveform, signal space representation & Derivation. 10
- c) Explain QASK transmitter & Draw signal space representation. 10
- 5. Solve any two.**
- a) Explain Direct sequence spread spectrum with neat block diagram. 10
- b) The slow hop FHSS with BFSK transmits two symbols per frequency hop & has PN generator with $K = 3$. For binary message sequence 011011011000. Draw the spectral output for the PN sequence of 001, 111, 011, 001, 110, 101. With frequency shift of $f_{C_i} \pm f_d$. 10
- c) Explain the use of TDMA & FDMA in GSM for increase in the number of users. 10
