

COLLEGE OF ENGINEERING, PUNE.
End Semester Examination
Digital Communication Systems (ET 302)

Program: Third Year B. Tech. (Electronics and Telecommunication)

Year: 2011-12

Duration: 3 hours

Semester: Autumn

Max. Marks: 50

Instructions:

1. Attempt ALL questions.
2. The sub-questions of a particular question should be attempted in the same order.
3. Draw neat figures wherever required.

Q 1 a)	Compare the PCM, DPCM, DM and ADM systems in terms of bit-rates, bandwidths, and performance at various bit-rates and also selection criteria for any specific application.	5
b)	A 7-bit PCM system employing uniform quantization has an overall signaling rate of 56 kbps. Calculate the signal to quantization noise ratio that would result when its input is a sine wave with peak to peak amplitude equal to 5. Calculate the dynamic range for the sine wave inputs in order that the signal to quantization noise ratio may be less than 30 dB. What is the theoretical maximum frequency that this system can handle?	5
Q.2 a)	Derive the expression for output-signal-to-noise ratio of a matched filter. Optimize it using schwarz's inequality. Hence write the expression for optimum transfer function of the matched filter in time domain and frequency domain.	5
b)	A compact Disc (CD) records audio signal digitally by using PCM. Assume the audio signal bandwidth to be 15 KHz. i) If the samples at Nyquist rate are quantized into 65,536 levels and then binary encoded, determine the number of binary digits required to encode a sample. ii) Determine the number of binary digits (bits) per second required to encode the audio signal. iii) For practical reasons, signals are sampled well above the Nyquist rate. Practical CDs use 44,100 samples per second. If the number of standard levels used is 65,536, determine the number of bits per second required to encode the signal, and the minimum bandwidth required to transmit the encoded signal.	5

Q 3 a)	Draw a block schematic of FH-SS. Explain its operation. Also explain slow and fast FH-SS.	5
b)	Explain the DS/SS system. Explain how DS/SS realizes its special features such as secure communication, jamming resistance, multiple access (CDMA).	5
Q.4 a)	Compare the system performance of FSK (coherent and non-coherent), PSK, DPSK and QPSK from the point of view of probability of error vs. E_b/N_o and their bandwidth requirement.	5
b)	Draw a neat schematic of a typical Digital Communication System (DCS) showing the sequence in which the various blocks of DCS appear. Explain the role of each block. Why E_b/ N_o is more significant in DCS over S/N? Express E_b/ N_o in terms of S/N.	5
Q.5 a)	Binary data is transmitted using PSK at a rate of 1 Mbps over a RF link having a bandwidth of 3 MHz. Assume the noise PSD at the coherent receiver input to be 10^{-10} W/Hz. Evaluate the signal power per bit required at the receiver input to maintain the probability of error less than or equal to 10^{-6} . Also evaluate the same if QPSK would have been used instead of PSK. Note: Use approximation $\text{erfc}(x) = [1/ (\text{Sq.root of } \pi) * x] * \exp(-x^2)$.	5
b)	Explain and compare the multiple access techniques i.e. FDMA, TDMA and CDMA.	5

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College of Engineering, Pune – 5

(An autonomous Institute of Government of Maharashtra)

End Semester Examination Nov. 2011

Year : T.Y.B.Tech

Subject: Power Electronics

Date: 24/11/11

Instructions:

1. Assume suitable data wherever necessary
2. Figures to the right indicate full marks

Specialization: E & TC

Max.Marks : 50

Duration : 3 Hrs

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- Q.1 a: What are the different control strategies for chopper? Explain them in brief 3
- b. Write suitable answer 1
1. The condition suitable for the inverting mode of operation of a single phase bridge rectifier is 1
 - a. $\alpha > 90$
 - b. An extra inductance in series with d.c. motor load with $\alpha > 120$
 - c. A battery in series with a d.c. motor, with $90 < \alpha < 120$
 - d. A battery and an extra inductance in series with the load with $\alpha > 120$
 2. The peak inverse voltage of a thyristor in a centre tapped secondary type of transformer ----- times that of the maximum voltage read at one of the secondaries.
- Q.2 a. For a step up chopper the input voltage is 200v. The load resistance is 10Ω , duty cycle is 40 %. Find average and RMS output current. 3
- b. State True or false 1
1. High value of di/dt is more harmful for a thyristor than a high value of dv/dt
 2. As the ambient temperature increases, the turn-on time of a thyristor increases but turn-off time decreases 1
- Q.3 a. Explain step-up and step down chopper. Derive for output voltage of both 5
- b. The average output voltage of flyback circuit is $V_0 = 24 \text{ v}$ at a resistive load of $R = 0.8 \Omega$. The duty cycle ratio $k = 50 \%$ and switching frequency is $f = 1 \text{ Khz}$. The on state drops of transistor and diodes are $V_t = 1.2 \text{ v}$ and $V_d = 0.7 \text{ v}$ 3

respectively. Turns ratio of transformers is $a = N_s/N_p = 0.25$. Determine

- 1) Average Input current I_s
- 2) Efficiency
- 3) Average transistor current I_a
- 4) Peak transistor current I_p
- 5) RMS transistor current I_r
- 6) Open circuit transistor voltage
- 7) Primary magnetizing inductance

OR

b. Draw circuit diagram of forward converter. Explain modes of operation and derive performance parameters

c. Explain briefly methods of triggering SCRs with circuit diagrams

2

Q.4 a. Draw circuit diagram of fly back converter. Explain modes of operation with suitable waveforms. Derive output voltage V_0 .

6

b. Compare fly back and forward converter

2

c. Explain two transistor model of thyristor

2

Q.5 a. Draw circuit diagram and explain single phase thyristorised Mc-Murray inverter with suitable waveforms

4

b. What are the different commutation circuits used for inverters

4

c. Analyze half bridge resonant inverter operated at output frequency $f_0 = 7 \text{ KHz}$ if $C_1 = C_2 = C = \mu\text{f}$, $L_1 = L_2 = L = 50 \text{ micro henry}$, $R = 2 \Omega$, $V_s = 220\text{v}$. Determine

7

a. Peak supply current b. average thyristor current I_a c. RMS thyristor current I_r

Best of Luck