Register Number: ……..

**B.E. DEGREE EXAMINATIONS: NOV/DEC 2010**

Fourth Semester

**COMPUTER SCIENCE AND ENGINEERING**

U07EC409: Analog and Digital Communication

**Time: Three Hours** **Maximum Marks: 100**

**Answer ALL Questions:-**

**PART A (10 x 1 = 10 Marks)**

1. In amplitude modulation
   A) the amplitude of the carrier varies in accordance with the amplitude of the modulating signal
   B) the amplitude of the carrier remains constant
   C) the amplitude of the carrier varies in accordance with the frequency of the modulating signal
   D) modulating frequency lies in the audio range.

2. The main advantage of the low level modulation is that
   A) it has maximum efficiency B) it requires a very low audio driving power
   C) circuitry involved is simpler D) it requires high power modulating signal

3. Armstrong modulator generates
   A) AM signals B) QPSK signals C) PM signals D) FM signals

4. FM signals contains intelligence in
   A) its frequency variations B) its amplitude variations
   C) both amplitude and frequency variations D) its phase variations

5. Companding is used
   A) to overcome quantizing noise in PCM
   B) to protect small signals in PCM from quantizing noise
   C) in PCM receivers to reduce impulse noise
   D) to increase the power content of the modulated signal

6. The resolution of a quantizer is
   A) directly proportional to step size B) indirectly related to number of levels
   C) directly related to number of levels D) dependent on range

7. Hartley's law is
   A) $I \propto B \times T$ B) $B \propto I \times T$ C) $T \propto B \times I$ D) $T \propto B$

8. In QAM, digital information is contained in
   A) both frequency and phase of the transmitted carrier.
   B) frequency of the transmitted carrier.
   C) amplitude of the transmitted carrier.
   D) both amplitude & phase of the transmitted carrier

9. One of the following is the spread spectrum modulation
   A) QPSK B) PSK C) DS/BPSK D) FSK

10. Pseudo-noise sequence is a
   A. Granular noise B. FH/MFSK modulator output noise
   C. output of the spread spectrum modulation D. noise like spreading code

## PART B (10 x 2 = 20 Marks)

11. For an AM DSBFC wave with a peak unmodulated carrier voltage $V_c$=10 $V_p$, a load resistance $R_L$ = 10Ω, and a modulation coefficient m =1, determine the total side band power.
12. What is the need of the double conversion in AM modulation?
13. For an FM modulator with a peak frequency deviation Δf =10 KHz, a modulating signal frequency $f_m$=10 KHz, Vc=10V, and a 500 KHz carrier, determine approximate minimum bandwidth using Carson's rule.
14. Define modulation index for FM and PM.
15. Define the compression characteristic of A-law companding
16. Mention the four primary causes for ISI
17. Define bit rate and baud in a digital modulation
18. A voice communications channel has signal-to-noise power ratio of 1000 and a band width of 2.7Khz.Determine the Shannon limit for information capacity.
19. What is spread spectrum modulation?
20. A spread spectrum communication system has the following parameters:

    Information bit duration $T_b$ = 4.095 ms

    PN chip duration, $T_c = 1\ \mu s$

    Determine the value of the Processing Gain (PG).

## PART C (5 x 14 = 70 Marks)

21. (a) (i) Derive an expression for total power in the AM wave. (6)

    (ii) For an AM DSBFC transmitter with an unmodulated carrier power $P_c$= 100W that is modulated simultaneously by three modulating signals with modulation co-efficients of $m_1$= 0.2, $m_2$ =0.4 and total transmitted power is 122.445W. Determine

    (a) Total side band power

    (b) Third modulating signal modulation co-efficient

    (c) Draw the power spectrum. (8)

**(OR)**

(b) (i) Draw the block diagram for the high level AM DSBFC transmitter. Also mention the three primary functions of the modulator circuit. (4)

(ii) Draw the block diagram of the AM super heterodyne receiver. Explain the function of the various sections of the receiver. (10)

22. (a) (i) Explain in detail the varactor diode direct FM modulator (7)

    (ii) Explain the AFC in direct FM generation (7)

**(OR)**

(b) (i) Write a note on commercial broadcast-band FM (5)

(ii) Explain in detail the balanced slope detector and compare with phase discriminator (9)

23. (a) (i) With necessary block diagram, explain a single channel, simplex PCM transmission system (8)

(ii) Explain in detail the sample- and-hold circuit. Also draw the input and output wave forms. (6)

**(OR)**

(b) (i)Write a note on the electrical specifications of the RS-232 Interface (7)

(ii) Draw and explain the Scrambler and descrambler circuits (7)

24. (a) (i) Explain the concept of digital modulation. (5)

(ii) Draw the block diagram for non coherent and coherent FSK demodulator.Also differentiate the non coherent and coherent detection. (9)

**(OR)**

(b) (i) Determine (a) the peak frequency deviation, (b)the minimum bandwidth and (c) baud rate for an FSK signal with a mark frequency of 49 Khz ,a space frequency of 51 Khz, and an input bit rate of 2Kbps. (6)

(ii) With necessary block diagram, explain the QPSK modulator. (8)

25. (a) (i)Explain in detail the FH /MFSK transmitter and receiver. (10)

(ii) What are multiple access techniques? (4)

**(OR)**

25. (b) (i)What is the need of cell splitting? How do you determine co-channel cells? (6)

(ii) Consider a transmitter which radiates a sinusoidal carrier frequency of 1850 MHz and a vehicle is moving with the speed of 26.82 m/s. Using Doppler shift frequency, compute the received carrier frequency if the vehicle is moving (a) directly towards the transmitter, (b) directly away from the transmitter, (c) in a direction which is perpendicular to the direction of the arrival of the transmitting signal. (8)

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