Reg. No. : | 9 | 2 | 0 | 2 | 1 | 4 | 1 | 0 | 4 | 0 | 1 | 0 |

Question Paper Code : 27164

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2015.

Third Semester

Computer Science and Engineering

CS 6304 — ANALOG AND DIGITAL COMMUNICATION

(Common to Information Technology, also common to Fourth Semester Biomedical Engineering)

(Regulations 2013)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. List the major segments of electromagnetic spectrum and give their frequency ranges.

2. Compare AM with DSB-SC and SSB-SC.

3. Sketch the digitally modulated waveforms for the binary data 110101 using ASK, FSK.

4. Why is FSK and PSK signals are preferred over ASK signals?

5. Why do we encounter aperture effect in PAM? How will you rectify it?

6. State the sampling theorem for band limited signal of finite energy.

7. Show that if c_i and c_j are two code vectors in the (n, k) linear block code, then their sum is also a code vector with an example.

8. Define channel capacity of a discrete memory Less channel.

9. What is Bluetooth?

10. What are the various handovers carried out in GSM?

11. (a) (i) The output modulated wave of a standard AM transmitter is represented $S(t) = 500(1 + 0.4\sin 3140t)\cos 6.28 \times 10^7 t$. This voltage is fed to a load of $600\,\Omega$. Find

         (1) Modulating frequency

         (2) Carrier frequency

         (3) Mean power output. (8)

    (ii) Derive efficiency η of standard AM and show that for a single tone AM, $\eta_{max} = 33.3\%$ at $\mu = 1$. (8)

Or

(b) With the help of neat block diagram explain about the generation of SSBSC wave and demodulation. (16)

12. (a) (i) Explain in detail about the operation of QPSK transmitter with necessary diagrams. (10)

    (ii) Compare QPSK and BPSK. (6)

Or

(b) Draw the block diagram of FSK system and explain its working. (16)

13. (a) The information in a analog wave form with maximum frequency $f_m = 3\, KHz$, is to be transmitted over an M-ary PAM system, where the number of pulse levels is M=16. The quantization distortions specified not to exceed + or − 1% of the peak to peak analog signal.

    (i) What is the minimum number of bits/sample or bits/PCM word that should be used in digitizing the analog waveform? (4)

    (ii) What is the minimum required sampling rate and what is the resulting bit transmission rate? (4)

    (iii) What is the PAM pulse or symbol transmission rate? (4)

    (iv) If the transmission bandwidth equals 12 KHz determine the bandwidth efficiency for this system. (4)

Or

(b) The information in an analog signal voltage waveform is to be transmitted over a PCM system with an accuracy of ±0.1% (full scale). The analog voltage waveform has a bandwidth of 100 Hz and an amplitude range of −10 to +10 volts.

    (i) Determine the maximum sampling rate required. (4)

    (ii) Determine the number of bits in each PCM word (4)

    (iii) Determine minimum bit required in the PCM signal (4)

    (iv) Determine the minimum absolute channel bandwidth required for the transmission of the PCM signal. (4)

14. (a) A source generates five messages m0, m1, m2, m3 and m4 with probabilities 0.55, 0.15, 0.15, 0.10 and 0.05 respectively. The successive messages emitted by the source are statistically independent. Determine code words for the messages and efficiency using Shannon Fano Algorithm. (16)

Or

(b) (i) Design a syndrome calculator for a (7,4) cyclic code generated by the polynomial $g(x) = x^3 + x + 1$. Calculate the syndrome for the received vector 1001101. (8)

(ii) Design a cyclic encoder for the same (7,4) cyclic code and obtain code vector for the message vector 1100. (8)

15. (a) Explain the architecture of GSM with a neat diagram. (16)

Or

(b) Explain the concept of cellular topology and cell fundamentals with examples. (16)