

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination November 2018

B. Tech in ECE Engineering, Semester V

Roll No.....

COURSE CODE: ECE 507

Time: 3 hours

Max. Marks: 80

COURSE TITLE: Analog and Digital Communication

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.

Q.1A Objective type multiple choice questions (10 questions @ 1 mark) 10

- i. Signum function $\text{sgn}(f)$, for $f > 0$, $f = 0$ and $f < 0$, has the values:
(A) -1 to +1
(B) +1, 0, -1 respectively
(C) $-\infty$ to $+\infty$
(D) 0 always
- ii. Find the Hilbert transform $m_h(t)$ of signal $m(t) = \sin(\omega_1 t) \sin(\omega_2 t)$. Assume $\omega_1 > \omega_2$
(A) $\cos(\omega_1 t) \cos(\omega_2 t)$
(B) $\sin(\omega_1 t) \sin(\omega_2 t)$
(C) $\sin(\omega_1 t) \cos(\omega_2 t)$
(D) $\cos(\omega_1 t) \sin(\omega_2 t)$
- iii. In AM multitoned modulation index are 0.1 and 0.2 and 0.5. The overall modulation index
(A) 0.11 (B) 0.33 (C) 0.55 (D) 0.88
- iv. For a FM signal $v(t) = 15 \cos(10 \times 10^8 t + 10 \sin 1220 t)$, the Carrier and Modulating frequency are
(A). 159.1MHz, 194.1 Hz (B). 185.5MHz, 200.15 Hz
(C). 350.1MHz, 200.1 Hz (D). 159.1Hz, 194.1Hz
- v. SSB -SC modulation is used for voice communication for following reason:
(A) It requires less
(B) It has higher efficiency for voice signals
(C) Bandwidth of voice signal is small
(D) Low frequency component of voice signal is zero
- vi. Aperiodic signals are example of
(A) Power signal (B) Energy Signal (C) Both (D) None of above
- vii. Noise voltage V_n and absolute temperature T are related as
(A) $V_n = 1 / \sqrt{4RKT B}$ (B) $V_n = \sqrt{4RK} / (TB)$
(C) $V_n = \sqrt{4RKT B}$ (D) $V_n = \sqrt{4KT B} / R$
- viii. In binary data transmission DPSK is preferred to PSK because
(A) Coherent carrier is not required to be generated at the receiver
(B) For a given energy per bit, the probability of error is less
(C) the 180° phase shifts of the carrier are unimportant
(D) More noise protection is provided against impulse

- ix A video transmission system transmits 625 picture frames per second. Each frame consists of a 400×400 pixel grid with 64 intensity levels per pixel. The data rate of the system is
(A) 16 Mbps (B) 100 Mbps (C) 600 Mbps (D) 6.4 Gbps
- x. The Nyquist sampling frequency (in Hz) of a signal given by $\text{sinc}(700t) + \text{sinc}(500t)$ is
(A) $1/350$ sec (B) $\pi/350$ sec (C) $1/700$ sec (D) $\pi/175$ sec
- Q.2 Short answer type questions (4 questions @ 2.5 marks) 10
- A Define Noise Figure. Write an expression for Noise Figure of three stages in cascade.
- B What is Carson's rule?
- C List advantages of Digital Modulation and communication?
- D What is Predictor circuit and why is it used?
- Q.3A Find the Fourier transform of gate pulse of amplitude A and time duration T. 05
- Q.3B Find convolution of $x(t) = u(t) - u(t-3)$ with $h(t) = u(t) - u(t-2)$ 05
- Q.4A Define Noise Figure and Noise Temperature. Write the relation between them. 05
- Q.4B What is the level of input signal required for an output $S/N = 10$ dB in a receiver with $NF = 6$ dB and Bandwidth $B = 0.1$ MHz? 05
- Q.5A What is Vestigial Sideband Modulation? Show the spectrum of VSB waveform? 05
- Q.5B Show that for VSM generation the filter should have response $H(\omega + \omega_c) + H(\omega - \omega_c) = \text{Constant}$. 05
- Q.6A Draw and compare phasor diagram for Amplitude Modulation and Frequency Modulation. 05
- Q.6B Explain with block diagram the generation of Narrowband FM 05
- OR
- Q.6B Draw the block diagram for frequency stabilization system used in FM transmitters. 05
- Q.7 Explain companding. How can we implement 12 bit to 8 bit companding? 10
- Q.8 Explain the block diagram and working of Differential Phase shift keying transmitter. Explain how its patterns are generated. 10
- OR
- Q.8 What are the main features of QAM? Explain 16bit QAM showing the constellation diagram. 10