Total number of printed pages: 2

UG/6th /UIE612

2024

COMMUNICATION ENGINEERING

Full Marks: 100

Time: Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. a) Explain wireless communication system. Define baseband signal and give its limitation. 5+2=7

   b) Explain the need of Fourier Transform with a suitable example in communication system. 7

   c) Find the carrier power of signal Acos ($W_c t$). 2

   d) The total power content of an AM signal is 1000W. Determine the power being transmitted at the carrier frequency and at each of the sidebands when the percent modulation is 100%. 4

2. a) How does modulation helps in reducing antenna height? 3

   b) Explain collector modulation to obtain AM wave 7

   c) Explain the Envelope detector and draw the characteristics of the linear diode detector and detected output. 7

   d) Draw the following signals in time domain. 3

   (i) Baseband Signal (ii) Carrier Signal (iii) AM signal

3 a) With the help of a balanced modulator explain the generation of the DSB-SC signal. 7

   b) Explain the following: 6+4=10

   (i)Phase shift method (ii) VSB modulation

   c) If a signal $E_I(t)$ is given to nonlinear device and its output is $E_0(t)$ and $E_0(t)$ is passed through a BPF to get an output signal Y(t). The nonlinear device is an ideal square law device with input output characteristics 3

   $E_0(t)=A\ E_I^2(t)$. Determine the output Y(t) if the input is given by-

   $E_I(t)=A\cos(W_c t+\beta \sin W_m t)$

[Turn Over]

4 a) Derive the general expression of FM modulation. 6

b) Derive the expression of Narrowband FM and draw its spectrum. 10

c) Explain PLL demodulator system. 4

5. a) Explain Pulse modulation. 6

b) Explain the generation of flat top PAM signal using sample and hold circuit. 6

c) Explain generation of PWM signal with neat block diagram and waveforms. 5

d) Explain different types of sampling methods. 3

6. a) Explain Delta modulation with a block diagram. Also write its disadvantages. 5+2=7

b) Given a sin wave of frequency f_m and amplitude A_m applied to delta modulator with step size Δ. Show that the slope overload distortion will occur if $A_m > \frac{\Delta}{2\Pi f_m T_s}$ 4

c) Draw the characteristics of A-law and μ-law companding. 4

d) The bandwidth of an input signal to the PCM is restricted to 5 KHz. The input signal varies in amplitude from -4 V to +4 V and has the average power of 30 mW. The required signal to noise ratio is given as 20 dB. Assuming uniform Quantization: 5

Find (i) no. of bits required per sample.

(ii) Outputs of 20 such PCM coders are time multiplexed. What would be minimum required transmission bandwidth for multiplexed signal?

7. a) What is TDM system? Also describe Synchronous and Asynchronous TDM System. 7

b) Draw the following data formats for the bit stream 1100110- 3

(i)Unipolar RZ (ii)AMI (iii)Manchester

c) Explain the following: 6+4=10

(i)DPSK (ii) Intersymbol Interference

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