Registration No : | | | | | | | | | | |

Total Number of Pages : 02 **B.Tech**

PET5I103

5th Semester Regular / Back Examination 2018-19

ANALOG COMMUNICATION

BRANCH : ECE, ETC

Time : 3 Hours

Max Marks : 100

Q.CODE : E391

Answer Question No.1 (Part-1) which is compulsory, any EIGHT from Part-II and any TWO from Part-III.

The figures in the right hand margin indicate marks.

Part- I

Q1 **Short Answer Type Questions (Answer All-10)** **(2 x 10)**

a) What are the need for modulation in communication systems?

b) An AM broadcast receiver has an IF of 465 KHZ and is tuned to 1000 KHz, and the RF stage has a tuned circuit with a Q of 50. Find image frequency.

c) What is frequency translation?

d) Define %modulation and Deviation ratio in FM.

e) State and Explain Carson's rule.

f) Consider an angle modulated signal $x(t) = 6\cos[2\pi\times10^6 t+2\sin(8000\pi t) + 4\cos(8000\pi t)]$ V. Find the average power of x(t).

g) Show the equivalence between FM and PM systems.

h) Find the variance of the random variable *X* with probability density function $f(x)=1/2|x|e^{-|x|}$.

i) Draw the amplitude spectrum of a rectangular pulse of width τ .

j) Write the Dirichlet's condition for Fourier series.

Part- II

Q2 **Focused-Short Answer Type Questions- (Answer Any EIGHT out of TWELVE)** **(6 x 8)**

a) Describe the working of a BJT-based amplitude modulator circuit

b) Write short notes on flicker noise and shot noise

c) Prove that balanced modulator suppresses the carrier.

d) A transmitter with a 10KW carrier transmits 11.2 KW when modulated with a single sine wave : -

i. Calculate the modulation index.

ii. If the carrier is also simultaneously modulated with another sine wave at 50% modulation, calculate the total transmitted power

e) With block diagram, explain the working of a super heterodyne receiver and list their advantages.

f) With block diagram, explain the working of a balanced modulator circuit using FETs, for the generation of double sideband suppressed carrier.

g) Explain with diagrams, how the response of parallel tuned circuit is made use for the demodulation of FM.

h) Explain generation of VSB using sideband shaping filter.

i) Why Pre-emphasis and De-emphasis used in FM?

j) If the signal $V(t) = 20\sin(2\pi\times10^6 t + 10\sin 2\pi\times10^3 t)$ represents a FM signal, determine

i. The carrier frequency

ii. The modulating frequency

iii. The modulation index

iv. The bandwidth required

v. Average power if the load resistance is $50\,\Omega$.

k) With block diagram, explain the working of a Foster Seeley discriminator.

l) Given FM and PM modulators with the following parameters. Deviation sensitivity as 1.2KHz/v and 1.2 rad/volts respectively. Carrier: 20 cos(2π×500×1000t), Modulating signal: 5 cos (2π×1000t). Determine modulation indices, Bandwidth and sketch the output spectrum for both modulators.

Part-III

Long Answer Type Questions (Answer Any TWO out of FOUR)

Q3 **a)** Derive an expression for spectrum of FM wave with sinusoidal modulation. **(16)**

b) Explain FM generation using direct method

c) Define % modulation and deviation ratio in FM

Q4 **a)** Explain the generation of Wide band frequency modulated wave by Armstrong method. **(16)**

b) A 100 MHz carrier wave has a peak voltage of 5V. The carrier is frequency modulated by sinusoidal modulating waveform of frequency 2 KHz such that the frequency deviation is 75 KHz. The modulated waveform passes through Zero and is increasing at time t = 0. Write the expression for frequency modulated signal.

c) Show that the spectrum of FM contains infinite number of side bands.

Q5 **a)** Derive the expression for the figure of merit of DSB-SC receiver. **(16)**

b) A FM signal with deviation of 75 KHz is applied to a FM demodulator. When the input SNR is 15dB the modulating frequency is 10KHz, Estimate the SNR at the demodulator output.

Q6 **a)** Explain the concept of pre-envelops. Obtain the Hilbert Transform of the following function ***x(t)= sin 2πft.*** **(16)**

b) With the block diagram explain the phase discrimination method of generation of SSB wave consisting of only USB signal.

c) For an AM signal $s(t) = A_c \cos[2\pi f_c t + \phi(t)]m(t)$, find

i. Pre-envelope
ii. Complex envelope
iii. Natural envelope