

B.E./B.TECH. Degree Examination, December 2020

Fourth Semester

**EC 16402 ANALOG COMMUNICATION SYSTEMS**

(Regulation 2016)

Time: Three hours

Maximum : 80 Marks

Answer **ALL** questions

**PART A - (8 X 2 = 16 marks)**

1. What is the carrier frequency in an AM wave when its highest frequency component is 650Hz and the bandwidth of the signal is 50Hz?
  - a. 80 Hz
  - b. 695 Hz
  - c. 625 Hz
  - d. 675 Hz
  
2. What is the required bandwidth according to the Carson's rule, when a 100 MHz carrier is modulated with a sinusoidal signal at 1KHz, the maximum frequency deviation being 30 KHz?
  - a. 1 KHz
  - b. 50 KHz
  - c. 62 KHz
  - d. 72 KHz
  
3. A band-limited low pass signal has 13 KHz as its highest frequency component. What is the minimum sampling frequency to reconstruct the signal at the receiver?
  - a. 20 KHz
  - b. 26 KHz
  - c. 13 KHz
  - d. 24 KHz
  
4. For a narrow band noise with Gaussian quadrature and inphase components, the probability density function of its envelope will be
  - a. Uniform
  - b. Gaussian
  - c. Rayleigh
  - d. Rician
  
5. What is the drawback of Foster seeley discriminator and how can this be overcome?
  
6. If a 10KW AM transmitter is modulated sinusoidally by 50% what is the total RF power delivered?
7. Why do we need multiplexing? Justify.
8. Give the mathematical expression for shot noise with all relevant parameters.

**PART B - (4 X16 = 64 marks)**

09. (a) (i) Examine the given expression and write the inferences you have made. (8)  
 $e_{AM} = 8(1+0.4\sin 5412t)\sin 8.243 \times 10^6 t$  also draw its frequency spectrum  
(ii) Compare and contrast different types of AM modulation schemes, with respect to (8)  
various parameters.

**(OR)**

- (b) (i) For an AM DSB-FC wave with peak unmodulated carrier voltage  $V_c=20V$ , a load resistance  $R_L=1k\Omega$  and a modulation coefficient  $m_a=0.8$ , determine powers of the carrier and the upper sidebands, total side band power, total power of the modulated wave and draw the power spectrum.  
(ii) Discuss the properties of Hilbert transform. (6)

10. (a) Deduce an expression for the generation of Frequency modulated output using varactor diode (16) modulator. Also draw the circuit diagram for the same.

**(OR)**

- (b) With a neat circuit and phasor diagram, analyze the ratio detector circuit for FM (16) demodulation.

11. (a) Consider two amplifiers are connected in cascade. The first stage amplifier has gain and noise figure as 10 dB & 2 dB. The second stage amplifier has a noise figure of 3 dB. Calculate the total noise figure. Also depict the same in a form of block diagram and derive the equation for noise figure of amplifiers connected in cascade. (16)

**(OR)**

- (b) Discuss the threshold effect in an envelope detector used in AM receiver and evaluate the (16) figure of merit for the same.

12. (a) A band limited signal  $x(t)$  is sampled by a train of pulses of width  $\tau$  and Period T, deduce an (16) expression for the sampled signal and justify how the signal can be reconstructed without aliasing.

**(OR)**

- (b) Compare and contrast different pulse time modulation systems with relevant diagrams. (16)