

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VI • EXAMINATION – SUMMER 2013****Subject Code: 160802****Date: 27-05-2013****Subject Name: Electronic Communication****Time: 10.30 am - 01.00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Explain operation of basic communication system. Describe fundamental limitations of a communication system. **07**
- (b) A 300 W carrier is simultaneously modulated by two audio waves with modulation percentage of 50 and 60 respectively. What is the total sideband power radiated? **07**
- Q.2** (a) A coil has a series resistance of 5Ω , a self capacitance of 7 pF, and an inductance of $1\mu\text{H}$. Determine the effective inductance and effective Q-factor when the coil forms part of a series tuned circuit resonant at 25 MHz. **07**
- (b) Explain thermal noise. Two resistors, $22\text{ k}\Omega$ and $47\text{ k}\Omega$ are at room temperature (300 K). Calculate, for a bandwidth of 100 kHz, the thermal noise voltage (i) for each resistor (ii) for the two resistors in series, and (iii) for the two resistors in parallel. **07**
- OR**
- (b) Define Noise Figure. For a two - stage amplifier, the first stage has a noise figure of 2 dB and a power gain of 12 dB, the second has a noise figure of 6 dB and a power gain of 10 dB. What is the overall noise figure (in dB)? **07**
- Q.3** (a) An audio frequency signal $20 \sin(2\pi \times 500t)$ is used to amplitude modulate a carrier of $50 \sin(2\pi \times 10^5 t)$. Calculate (i) Modulation index (ii) Sideband frequencies (iii) Amplitude of each sideband frequency (iv) Bandwidth required (v) Total power delivered into a load of 600Ω . **07**
- (b) What are the advantages of single sideband (SSB) modulation over double sideband with suppressed carrier (DSBSC)? Calculate the percent power saving for a DSBSC signal for the modulation percentage of (i) 100 % and (ii) 50 %. **07**
- OR**
- Q.3** (a) Explain operation of an envelope detector circuit. Explain the importance of RC time constants for the envelope detector circuit. Also state and explain various distortions encountered in the envelope detector. **07**
- (b) The antenna current of an AM transmitter is 8 A when only carrier is sent, but is increased to 8.96 A when the carrier is modulated by a single tone sinusoid. Find the percentage modulation. Find the antenna current when the depth of modulation is changed to 0.8. **07**
- Q.4** (a) Define frequency modulation. What are the advantages and disadvantages of FM as compared to AM? **07**

- (b) A carrier is frequency modulated by a sinusoidal modulating signal of frequency 2 kHz, resulting in a frequency deviation of 5 kHz. What is the bandwidth occupied by the modulated waveform? The amplitude of the modulating sinusoid signal is increased by a factor of 3 and its frequency is lowered by 1 kHz. What is the new bandwidth? **07**
- OR**
- Q.4** (a) Explain the significance of the terms 'sensitivity' and 'selectivity' as applied to a receiver. Which of the receiver stages control these characteristics? **07**
- (b) A radio receiver is tuned to 792 kHz. For an intermediate frequency of 455 kHz calculate: (i) Image frequency (ii) Rejection ratio if loaded Q of RF section is 50 (iii) Rejection ratio at 25 MHz with same Q. **07**
- Q.5** (a) State and explain Kepler's laws in relation to artificial satellites orbiting the earth. Differentiate between geosynchronous and geostationary satellite orbits. **07**
- (b) Find the Fourier transform of function $x(t) = 4t$. **07**
- OR**
- Q.5** (a) What is transponder? Explain C band satellite transponder channels with appropriate frequency allocation and polarization. **07**
- (b) State and explain properties of Fourier Transform. **07**
