

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**BE - SEMESTER-V • EXAMINATION – WINTER • 2014**

**Subject Code: 151004****Date: 01-12-2014****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) Draw the general block diagram of a super heterodyne receiver and briefly explain the function of each block. **07**
- (b) Derive an expression for equivalent noise bandwidth for a series RC network. **07**
- Q.2** (a) Give complete classification of noise. Explain the shot noise in details. **07**
- (b) In a broadcast super heterodyne receiver having no RF amplifier, the loaded Q of the antenna coupling circuit at the input to the mixer is 100. If the intermediate frequency is 455 kHz, calculate (1) the image frequency and its rejection ratio at 1000 kHz and (2) the image frequency and its rejection ratio at 25 Mhz. **07**
- OR**
- (b) Derive an expression for 3-dB bandwidth of a series RLC circuit. **07**
- Q.3** (a) An AM signal is represented by **07**  
 $e(t) = (10 + 4 \cos 1000\pi t) \cos (2\pi \times 10^6 t)$   
 Find: Modulation index, total power and transmission Bandwidth required for this AM signal.
- (b) Explain the process of an SSB-SC signal generation using phase shifting method with relevant mathematical expressions. **07**
- OR**
- Q.3** (a) A DSB-SC transmitter radiates 2 kW when modulation depth is 50%. The modulating signal has maximum frequency of 5 kHz. How much of carrier power is required in units of kW? Find the transmission bandwidth required. If we want to transmit the same message by an AM transmitter what is the change required in transmission bandwidth? **07**
- (b) The antenna current of an AM transmitter is 8 A for an un-modulated carrier but it increases to 8.93 A when the carrier is modulated by a single sine wave. Find the percentage modulation. Determine the antenna current when the percentage modulation changes to 0.8. **07**
- Q.4** (a) An PM signal is given by  $s(t) = 2 \cos (2\pi \times 10^6 t + 5 \cos (1000\pi t))$ . Find the maximum frequency deviation of this signal. If modulating frequency is doubled what effect will it have maximum frequency deviation? **07**
- (b) A super heterodyne receiver is to operate in the range of 550 kHz- 1650 kHz, with intermediate frequency of 450 kHz. Determine the required capacitance ratio of the local oscillator. Also find image frequency when this receiver is tuned to 800 kHz. **07**
- OR**
- Q.4** (a) Explain the indirect method of generating FM signal with neat block diagram and relevant mathematical expressions. **07**
- (b) Describe the operation of balanced slope detector with relevant circuit diagram. **07**
- Q.5** (a) In a series RLC circuit  $R=10 \Omega$ ,  $L= 100 \text{ mH}$  and  $C= 47 \mu\text{F}$ . Determine 3-dB bandwidth of this circuit. **07**

(b) Determine Fourier Transform of a signum function,  $sgn(t)$ . **07**

**OR**

- Q.5** (a) State and prove convolution property. **07**  
(b) Explain the concept of frequency division multiplexing with an example. Also state its merits and demerits. **07**

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