Seat No.: _____ Enrolment No._____

# GUJARAT TECHNOLOGICAL UNIVERSITY

**BE – SEMESTER V • EXAMINATION – WINTER - 2012**

**Subject code: 151004** **Date: 16-01-2013**

**Subject Name: Electronic Communication**

**Time: 02:30 pm to 05:00 pm** **Total Marks: 70**

**Instructions:**

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

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|---|---|---|---|
| **Q.1** | **(a)** | An FM wave is given by $e(t) = 20\sin(6 \times 10^8 t + 7\sin 1250 t)$. Determine (i) The carrier frequency (ii) Modulating frequency (iii) The modulation index (iv) The maximum deviation. | **07** |
| | **(b)** | The noise figure of a receiver is 20dB and it is fed by a LNA which has a gain of 40dB and noise temperature of 80 $^{o}$K. Calculate the overall noise temperature of the receiver system and the noise temperature of the receiver. | **07** |
| **Q.2** | **(a)** | Define Superhetrodyne principal. Draw the superhetrodyne receiver block diagram with signal spectra and briefly explain each block. | **07** |
| | **(b)** | With related to Amplitude modulation discuss following parameters (i) Modulation index (ii) Modulation depth (iii) Bandwidth requirement (iv) Power distribution in sidebands and carrier | **07** |
| | | **OR** | |
| | **(b)** | A series tuned circuit has a Q of 130 and a tuning capacitance of 250pF and is resonant at 450kHz. Determine (i) the impedance at resonance, and (ii) the relative response of circuit at a frequency of 400 kHz. | **07** |
| **Q.3** | **(a)** | List the methods used to generate SSB modulation signal. Discuss any one method in detail. | **07** |
| | **(b)** | Explain the working of amplitude demodulator circuit with the remedy for avoiding diagonal peak clipping and negative peak clipping. | **07** |
| | | **OR** | |
| **Q.3** | **(a)** | Define noise factor. Drive the Friis's formula for noise factor when amplifiers are in cascade connection. | **07** |
| | **(b)** | Define the energy spectral density. Estimate the essential bandwidth W rad/s of the signal $e^{-at}u(t)$ if the essential band is required to contain 97% of the signal energy. | **07** |
| **Q.4** | **(a)** | Define the unit impulse signal. Find the Fourier transform of unit impulse signal and sinusoidal signal $\cos 2\pi f_o$ | **07** |
| | **(b)** | Write a short note on Automatic Gain control in Superhetrodyne receiver. | **07** |
| | | **OR** | |
| **Q.4** | **(a)** | Discuss the importance of Pre-emphasis and De-emphasis circuits in FM broadcasting.. | **07** |
| **Q.4** | **(b)** | Discuss the basic principal of FM detection and explain Foster-seeeley Discriminator. | **07** |
| **Q.5** | **(a)** | Find the equation for resonant frequency and -3db bandwidth in parallel tuned circuit. | **07** |
| | **(b)** | State the Parseval's theorem. Prove it for the signal : $g(t) = e^{-at}u(t)$ $(a > 0)$. | **07** |
| | | **OR** | |
| **Q.5** | **(a)** | State and prove the following Fourier transform properties (i) Time-Scaling property, (ii) Time integration property. | **07** |
| | **(b)** | Explain briefly what is meant by skin effect and why it is undesirable. What steps may be taken to reduce skin effect in inductors? | **07** |

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