

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-V (NEW) EXAMINATION – WINTER 2021****Subject Code:2151004****Date:03/01/2022****Subject Name:Electronics and 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.
4. Simple and non-programmable scientific calculators are allowed.

MARKS

- Q.1** (a) Define term modulation in context to communication process. Describe needs of modulation process in detail. **04**
- (b) With suitable circuit diagram describe the working of envelope detector circuit for demodulating the AM wave. **03**
- (c) Derive the expression of sinusoidal AM wave. A modulating signal $m(t) = 10\cos(2\pi \times 10^3 t)$ is amplitude modulated with a carrier signal $c(t) = 50\cos(2\pi \times 10^5 t)$. Find the modulation index, the carrier power, and the power required for transmitting AM wave. Also draw the amplitude spectrum of AM wave. **07**
- Q.2** (a) Describe the significance of Carson's rule used in FM wave bandwidth approximation process. Also with help of the neat block diagram explain Armstrong method for generating FM waves. **07**
- (b) Compare FM and AM processes. **03**
- (c) Enlist at least four FM demodulator circuits. Also describe working of Foster-Seeley discriminator with required details. **04**
- Q.3** (a) Define noise factor and noise temperature. Derive the Friss formulae for deriving the value of noise factor with cascaded amplifiers connection scenario. **07**
- (b) List out main functions of the communication radio receiver circuits. Also define the following terms related to radio receiver: (1) Selectivity (2) Fidelity (3) Sensitivity. **07**
- OR**
- (a) Draw block diagram of Super-heterodyne receiver and explain the functionality of its each block with necessary details. **07**
- (b) Briefly describe different noise types related to overall communication process. **07**
- Q.4** (a) Explain the process of an SSB-SC signal generation using phase shifting method with relevant mathematical expressions. **07**
- (b) Explain the importance of pre-emphasis and de-emphasis circuits. Also describe functioning of pre-emphasis and de-emphasis circuits with necessary details. **07**
- OR**
- (a) Explain the direct method to generate FM signal with necessary details. **07**
- (b) A FM wave is given by $s(t) = 20\cos(8\pi \times 10^6 t + 9\sin(2\pi \times 10^3 t))$. Compute the frequency deviation, bandwidth, and power of the given FM wave. **07**
- Q.5** (a) Derive an equation for impedance of series tuned circuit in terms of quality factor. Also define term skin effect and suggest possible ways to reduce it. **07**
- (b) Define the terms. Signal Bandwidth (ii) Power Spectral Density (iii) Distortion **07**
Also state and prove time shifting property of Fourier transform.
- OR**
- (a) List out different types of noise existing during the working of a communication system. Also briefly describe about shot noise, partition noise and flicker noise. **07**
- (b) Describe Ham radio concept with required details. Also describe the usage significance of Ham radio during the occurrence of natural calamities. **07**