2123

**B.E. (Electrical and Electronics Engineering)**
**Fifth Semester**
**PE-EE-504 (a): Communication Systems**

Time allowed: 3 Hours

Max. Marks: 50

*NOTE: Attempt __five__ questions in all, including Question No. I which is compulsory and selecting two questions from each Part. Use of scientific calculator is allowed.*

x-x-x

I. (a) What do you mean by base-band and pass-band communication systems. (2)

(b) What are the different noises in Delta modulation systems. (2)

(c) What are the differences between PCM and DPCM modulation techniques. (2)

(d) What are the differences between narrow-band and wide-band FM systems. (2)

(e) Determine the instantaneous frequency of following signal.
$x(t) = \cos 200\pi t \cos(5 \sin 2\pi t) + \sin 200\pi t \sin(5 \sin 2\pi t)$ (2)

## Part- A

II. (a) Prove mathematically that AM wave contains one carrier and two sidebands. (5)
(b) What you mean by direct and indirect FM generation. (5)

III. Examine FM modulated signal given below with $f_m$=1kHz, and solve for modulation index and bandwidth when (10)

$$y(t) = 10\cos[\omega_c t + 3\sin\omega_m t]$$

a) $f_m$ is doubled (b) $f_m$ is decreased by one-half.

IV (a) illustrate that FM modulated wave has constant average power. (5)

(b) Prove that noise figure in SSB systems is one. (5)

## Part-B

V. (a) What are the advantages and disadvantages of QAM techniques and also mention its applications. (5)
(b) What do you mean by linear and non-linear equalization? Give its significance. (5)

VI.(a) A baseband digital system uses 4-level PAM along with the raised cosine pulse. The system has a frequency response of 3.2 kHz. If the binary data is transmitted at 9600 bps data rate, then what would be the symbol rate and roll-off factor of the transmitted pulse shape for zero ISI? (5)

(b) Explain Viterbi receiver algorithm in detail. (5)

VII. (a) Explain Nyquist criterion for zero ISI. How ISI can be controlled. (5)

(b) Two quadrature carriers $\cos 2\pi f_c t$ and $\sin 2\pi f_c t$ are used to transmit digital information over AWGN channel at two different data rates of 10kbps and 100kbps respectively. Determine relative amplitude of the for the two carriers such that SNR for the two channels is same. (5)

x-x-x