Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

FIFTH SEMESTER B.Tech. (E & C) DEGREE END SEMESTER EXAMINATION
NOV/DEC 2017
SUBJECT: ANALOG COMMUNICATION (ECE - 3103)

TIME: 3 HOURS **MAX. MARKS: 50**

Instructions to candidates

- Answer **ALL** questions.
- Missing data may be suitably assumed.

1A. Find the Fourier series of a periodic train of rectangular pulses as shown in Figure Q1A of duration T, period T_0 and plot the amplitude and phase spectrum.

1B. Show that $sinc(\alpha t) * sinc\ (\beta t) = \frac{1}{\beta} sinc\ (\alpha t)$. $\alpha \leq \beta$.

1C. Find the Hilbert transform of Dirac delta function $\delta(t)$. Plot amplitude & phase response of the Hilbert transformer.

(5+3+2)

2A. With neat diagram, Derive Friis' formula of N cascaded amplifier in terms of noise equivalent temperature.

2B. Figure Q2B shows the power spectral density of a power signal $g(t)$. Determine the auto correlation of this signal.

2C. Define Energy Spectral Density. List their properties.

(5+3+2)

3A. With relevant circuit diagram and waveforms, derive the expression for the modulated wave at the output of the switching modulator. Mention the filter specifications required to choose the modulated wave.

3B. With neat block diagram, briefly explain FDM system. Determine the minimum transmission bandwidth required by the communication channel to transmit 26 independent voice inputs each of bandwidth 4kHz using DSBSC modulation technique.

3C. The noise figure of an amplifier is 8dB at 27^0 C .Calculate amplifier noise to an input of bandwidth 500MHz.

(5+3+2)

4A. With neat diagram, explain the working principle of the ring modulator and its purpose. Derive an expression for the frequency domain representation of the ring modulator. Is there any additional system required to be connected to the ring modulator to get its purpose completely served? If yes, what are the specifications of this system? Obtain the spectral expression of the output of this system if the output of the ring modulator is applied as input to this system.

4B. Compare the characteristics of different form of AM modulation techniques.

4C. Obtain the time domain expression of VSB modulated signal for an information signal $m(t)$ band - limited to W Hz.

(5+3+2)

5A. With neat block diagram, derive the expression for demodulation of FM signal using Phase locked loop.

5B. A signal $m(t) = 2\cos(2\pi 10^3 t)$ angle modulates a carrier signal $A_c cos\, w_c t$. Determine the modulation index and bandwidth of the modulated signal for (i) an FM system with k_f=12 Hz/volt and (ii) a PM system with k_p=1.0 rad/volt. Also write the time-doamin expression for the FM and PM signal.

5C. With neat block diagram, explain demultiplexer used in receiver of FM stereo.

(5+3+2)

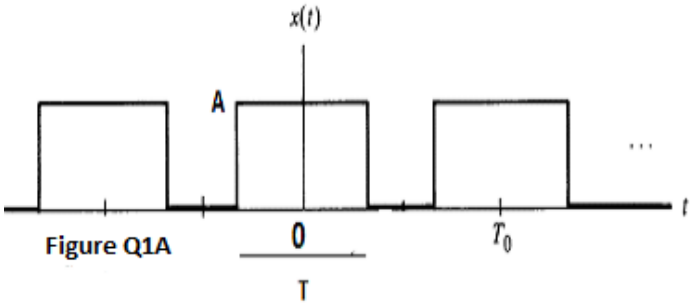

Figure Q1A

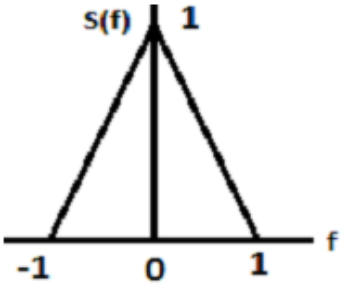

Figure Q2B