

Time: 3 hours

Max. Marks: 75

Answer any five questions
All questions carry equal marks

1. With a neat diagram explain the generation of AM wave using:
 - a) Square law modulator.
 - b) Switching modulator.
- 2.a) Consider the obtained by adding a non coherent carrier $A_c \cos(2\pi f_c t + \varphi)$ to DSB-SC wave $m(t) \cos(2\pi f_c t)$ where $X(t)$ is the message waveform. This waveform is applied to an ideal envelope detector. Find the resulting detector output. Evaluate the output for
 - i) $\varphi = 0$
 - ii) $\varphi \neq 0$ and $|X(t)| \ll A_c / 2$.
- b) Explain demodulation SSB wave using coherent detection.
- 3.a) Explain how to generate SSB using filter method and phase shift method.
- b) Explain the effects of frequency and phase errors in synchronous detection- DSB-SC, SSB-SC cases.
- 4.a) An angle modulated signal has the form $u(t) = 100 \cos[2\pi f_c t + 4 \sin 2000\pi t]$ where $f_c = 10$ MHz determine:
 - i) The average transmitted power
 - ii) Peak phase deviation.
 - iii) Determine the peak frequency deviation.
- b) Derive the equations for FM and PM waves.
- 5.a) What is an FM detector? Explain the operation of foster seeley discriminator?
- b) A semiconductor junction diode is used to modulate the frequency of oscillator. The junction capacitance is the total tuning capacitance of the oscillator tank circuit. When DC bias voltage of 15V is applied to the diode. The oscillator frequency generated is 5MHz. If a single tone modulating voltage $4\varphi(12560t)$ modulated the carrier: Find
 - i) The percentage 2nd harmonic distortion
 - ii) Frequency modulation index.
- 6.a) The normalized message signal $m_n(t)$ has a band width of 5000 Hz and power of 0.1W, and the channel has a band width of 10 kHz and attenuation of 80 dB. The noise is white with power spectral density 0.5×10^{-12} W/Hz, and the transmitter power is 10 Kw
 - i) If AM with $a=0.8$ is employed what is SNR_0
 - ii) If FM is employed what is the highest possible SNR_0 .
- b) Explain the following:
 - i) Pre-emphasis
 - ii) De-emphasis.
- 7.a) Calculate the image rejection of double conversion receiver which has a first IF of 1MHz and second IF of 200KHz, an RF amplifier whose tuned circuit has a Q of 75 (same as that of mixer) and which is tuned to a 30MHz signal. Give answer in dB.
- b) What is an amplitude limiter? Explain its operation with a neat circuit diagram?
8. What is a Pulse Time modulation? Explain the different types of Pulse Time modulation techniques.