National Institute of Technology, Delhi

Name of the Examination: B.Tech

Branch	: ECE	**Semester**	:IV
Title of the Course	: Analog Communication	**Course Code**	: ECB 253
Time: 2Hours		**Maximum Marks: 25**	

Note:
- Questions are printed on BOTH sides. Answers should be CLEAR, TO THE POINT AND LEGIBLE.
- In total there are Eight(8) questions with their marks shown individually. All questions are compulsory.
- All parts of a single question must be answered together and in the same sequence as given in question paper. ELSE QUESTION SHALL NOT BE EVALUATED.

Q1. An AM Signal is given by $s(t) = [20 + 4\cos \pi 10^4 t + 8\cos 8\pi 10^4 t]\cos 2\pi f_c t$.   [1+1+1]
Find the following:
(a). Total Power
(b). Efficiency.
(c) Draw its frequency Spectrum.

Q2.   [1+1+2]
(a) What is QNE. In which modulation schemes it is present.
(b) What are the advantages of doing Modulation.
(c) Draw the Block diagram of Frequency Division Multiplexing .Briefly explain the functioning of each Block.

Q3.   [1+2]
(a)Classify DSB-FC modulation with respect to its modulation Index.
(b) Draw the schematic of Ring Modulator. Briefly explain its functioning.

Q4.   [2+2+1]
(a) Highlight main differences between DSB-SC ,SSB-SC and DSB-FC.
(b)Find percentage of modulation such that maximum peak amplitude of AM signal is two times peak amplitude of unmodulated carrier.
(c) An AM(DSB-FC) signal $x(t) = 5 [1+2\cos w_m t]\cos w_c t$ is to be demodulated . To get back message signal which of the AM demodulators can be used for this signal .

Q5.   [1+2]
(a) Write down the mathematical condition on time constant to get back the message signal through the envelope detector.
(b)A simple diode detector is uses a load resistance of 400Kilo-ohms.Across the resistance, there is a 100 p.f capacitor. If the maximum modulation depth of the input amplitude modulated signal is 75% .What is the maximum frequency of the the modulating signal that can be detected without diagonal clipping.

Q- 6 A carrier, Amplitude modulated to a depth of 50 % by a sinusoid, produces side frequencies of 5.005Mhz and 4.995 Mhz. The amplitude of each side band frequency is 40V . Find the frequency and amplitude of the carrier signal.   [2]

Q-7 An AM transmitter has an unmodulated carrier power of 10KW. It can be modulated by a sinusoidal modulating voltage to a maximum depth of 40%, without overloading the transmitter. If the maximum modulation index is reduced to 30% ,what is the extent upto which the unmodulated carrier power can be increased without overloading the transmitter . [3]

Q-8 A baseband signal m(t) is DSB-SC modulated with carrier signal c(t) and sent through the channel where a noise signal n(t) gets added to it . After passing through the channel it is now passed through a low pass filter (cutoff frequency,fc = 1 Hz). Find what all frequencies are now present in the signal y(t). [2]

Given : $m(t) = \dfrac{2\sin 2\pi t}{t}$, $c(t)=\cos(2000\,\pi t)$, $n(t) = \dfrac{\sin(198\pi t)}{t}$