

BACHELOR OF INSTRUMENTATION & ELECTRONICS ENGINEERING EXAMINATION, 2019
(3rd Year, 2nd Semester)
SIGNAL PROCESSING AND TRANSMISSION

Time : Three hours

Full Marks: 100

Module-1: Answer any one question

1 i) Find the Fourier Transformation of the signal

4

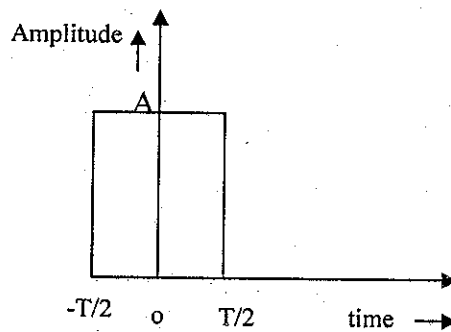
$$x(t) = \begin{cases} e^{-at} & \text{for } t \geq 0 \\ 0 & \text{for } t < 0 \end{cases}$$

(a is a positive number)

ii) Find the Fourier Transformation of

$$x(t) = \begin{cases} A & \text{for } -T/2 < t < T/2 \\ 0 & \text{otherwise} \end{cases}$$

8



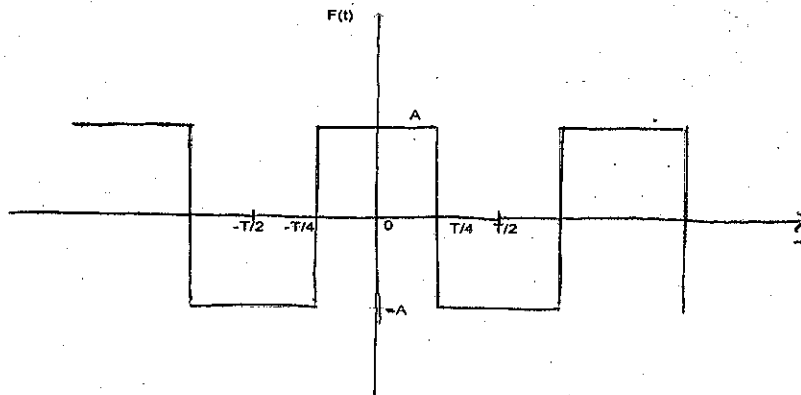
iii) State and prove frequency convolution and time theorem.

4+4

2. i) State the classifications of different signals with example.

ii) Obtain the Fourier Components of the signal given below

10+10=20



Module -2: Answer any two questions

3. i) What are the needs for modulation? Derive the expression for a) modulation index and b) transmitted power in terms of carrier power and modulation index.
ii) Explain the principle and operation of Envelope detector circuit used for AM detection. 4+3+3+10
4. i. Explain detail operation of Costa's Loop.
ii. A radio transmitter radiates 10 KW and carrier power is 8.5 KW. Calculate modulation index.
iii. A carrier wave of frequency 10 MHz and peak value 10V is amplitude modulated by a 5 KHz sine wave of amplitude 6V. Determine the modulation index and amplitude of the side frequencies. Calculate modulation index. 12+4+4
5. i) Find the mathematical expression for FM and PM signals.
ii) Generation of WBFM by Armstrong's Method.
iii) A sinusoidal wave of amplitude 10volts and frequency of 1 kHz is applied to an FM generator that has a frequency sensitivity constant of 40 Hz/volt. Determine the frequency deviation and modulating index. (5+5)+6+4
6. i) Describe generation of AM signal using non-linear device. 4
ii) Describe the advantages & disadvantages of SSB-SC signal. 4
iii) Describe the demodulation of SSB-SC signal. 6
iv) Describe generation of SSB-SC signal using phase discrimination method 6

Module 3: Answer any one question

7. i) Describe the demodulation of FM signal using PLL?
ii) What is mixer? Describe up and down-conversion. 14+2+4
8. i) Briefly explain the function of each of the blocks of the superheterodyne receiver.
ii) A super heterodyne receiver with an IF of 455 kHz is tuned to a signal at 1500kHz. What will be the image frequency? 16+4

Module 4: Answer any one question

9. i) Describe different types of transmission lines.
ii) Derive voltage and current equations for the transmission line. 10+10
10. i) Explain the basis for construction of Smith chart.
ii) Discuss the characteristic features of the Smith Chart. 15+5