B.E. INSTRUMENTATION AND ELECTRONICS ENGINEERING THIRD YEAR FIRST SEMESTER – 2024
SIGNAL TRANSMISSION & COMMUNICATION SYSTEMS

Full Marks: 100

Time: Three hours

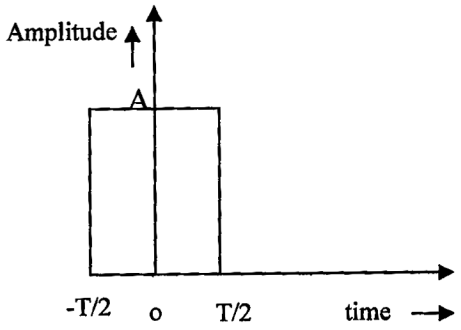
Module-1

1. i) Define: 2x3=6

a) Energy and Power Signal
b) Odd and Even Signal
c) Vector and Scalar Signal

iii) Find the Fourier Transformation of

$$x(t) = \begin{cases} A & for \quad -T/2 < t < T/2 \\ 0 & otherwise \end{cases}$$ 5

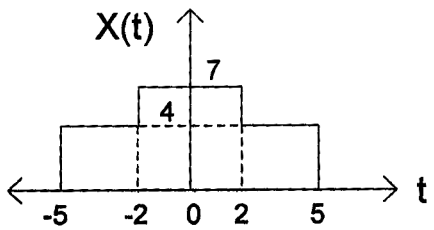


iv) Prove the following properties of the Fourier Transformation $3 \times 3 = 9$

a) Convolution
b) Time scaling
c) Frequency Shifting

OR

2) i) Write the Dirichilet conditions for the Fourier transformation. 5
ii) Discuss the Parseval theorem and Duality property of Fourier transformation. 5+5=10
iii) Find the Fourier transformation of the below signal 5



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) With necessary equations, explain the principle of SSB-SC generation. 5+2+5+8

4.i) Explain the principle and operation of Envelope detector circuit used for AM detection.
ii) Describe quadrature null effect in DSB-SC. 10+10

5. i) Explain detailed operation of Costa's Loop.
iii) Describe FM generation process using VCO. 10+10

6. i) Find the mathematical expression for FM and PM signals. 5+5
ii) How do you get FM from PM and vice versa? 5
iii) Comparison between AM and FM 5

Module 3:

7.i) Describe the demodulation of FM signal using PLL?
ii) What is mixer? Describe up and down-conversion. 14+2+4

OR

8. i) Briefly explain the function of each of the blocks of the superheterodyne receiver.
ii) What is image frequency?
ii) A super heterodyne receiver with an IF of 455 kHZ is tuned to a signal at 1200kHZ. What will be the image frequency? 14+3+3

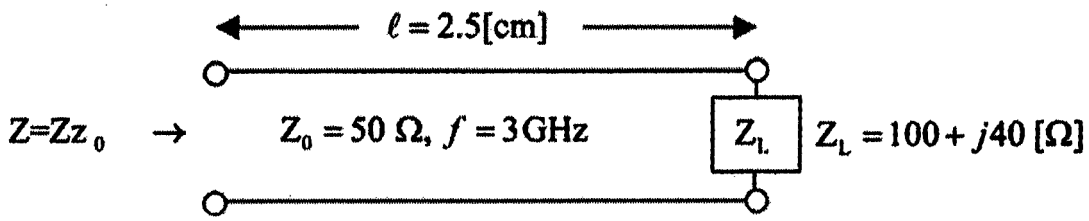
Module 4 Answer any one questions.

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

11. i) Discuss the steps to calculate reflection co-efficient at a distance from the load using smith Chart.
ii) For a low-loss transmission line derive the expressions for attenuation constant, phase constant and characteristic impedance
iii) Derive the relations between VSWR and reflection coefficient. 8+9+3

12. i) What is antenna? Discuss isotopic and omnidirectional antenna.
ii) Discuss basic parameters of antenna radiation pattern.
iii)



Fine following parameters from smith chart
a) VSWR
b) Reflection Coefficient
c) Input impedance. (2+2+2) +6+8

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Smith Chart

Roll No:_____