2603N1726

Candidate's Seat No :_____

M.Sc. Semester-3 Examination

504

Physics

March-2024

Time : 2-30 Hours] **[Max. Marks : 70**

Q.1 (A) Draw the circuit approximation of a section of a transmission line. Derive an expression for input impedance of a transmission line as a function of length. [07]

(B) Explain with necessary equations how a section of a short circuited transmission line can be used as capacitive and inductive circuit element in high frequency (R.F.) circuits. [07]

OR

Q.1 (A) What is Smith chart? Derive the equations of constant resistance and reactance circles of Smith chart. Discuss how Smith chart is obtained from these equations. [07]

(B) Explain the terms: [07]

(i) Reflection coefficient

(ii) VSWR

(iii) Quarter wave transformer

Q.2 (A) Explain the principle, structure and important properties of Yagi- Uda antenna. [07]

(B) Write a detailed note on: log - periodic antenna. [07]

OR

Q.2 (A) Derive radiation field equations for Hertzian dipole. [07]

(B) Discuss the effect of ground on antennas. [07]

Q.3 (A) Define amplitude modulation. [07]
Derive the expression for instantaneous voltage of amplitude modulated wave. Define amplitude modulation index ($\mathbf{m_a}$).

(B) Draw and discuss the circuit of a Balanced Modulator using JFET to generate **Double sideband suppressed carrier (DSBSC)** signal. [07]

OR

Q.3 (A) Describe **Armstrong method** of FM generation. [07]

(B) Draw circuit of **Foster Seeley** detector and explain the demodulation process of FM wave. List the advantage of this detector. [07]

Q.4 (A) List the various types of Pulse Modulations. Describe Pulse amplitude modulation(PAM) in detail. Draw its frequency spectrum and explain aliasing effect. [07]

(B) What is meant by probability of bit error in baseband transmission system? Draw circuit of a matched filter for rectangular pulses and explain its working. [07]

OR

Q.4 (A) Describe Binary Phase Shift Keying **(BPSK)**. Draw its frequency spectrum. [07]

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(B) What is meant by bit timing recovery? Discuss Early - Late gate circuit for bit timing recovery. [07]

Q.5 Answer in brief **Any Seven** questions from the following: (Each question is of **two** mark). [14]

(i) Define characteristic impedance.

(ii) What will be the reflection coefficient of a 50 Ω microwave transmission line terminated in a short?

(iii) Give two examples of multiconductor conductor transmission line.

(iv) An antenna has a radiation resistance of 72 Ω, a loss resistance of 24 Ω, and a power gain of 16. Calculate its efficiency.

(v) What is called Fraunhofer region?

(vi) Draw radiation pattern of a parabolic reflector antenna.

(vii) If two signals having frequencies 1000 kHz and 5 kHz are given to Balanced modulator , then what will be frequencies present at the output.

(viii) What sampling rate would be appropriate for a telephone signal with a maximum signal frequency of 5 kHz?

(ix) Give three reasons that explain the need of modulation.

(x) According to Carson Rule, calculate the bandwidth of a Frequency modulated wave with modulating signal frequency (f_m) = 5 kHz and maximum frequency deviation (Δf) =75 kHz.

(xi) A 8-bit PCM channel is using Raised-cosine filtering with roll off factor of unity applied to the transmission facility to reduce ISI noise. What will be the $(S/N)_q$ ratio in db.

(xii) A sinusoidal signal with a maximum peak input voltage of 5 V is applied to a PCM channel using a 8-bit code word. What will be the width of each level in mV?

***** PAPER ENDS *****