WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 5th Semester Examination, 2020, held in 2021

ELSADSE02T-ELECTRONICS (DSE1/2)

Time Allotted: 2 Hours   Full Marks: 40

The figures in the margin indicate full marks.
Candidates should answer in their own words and adhere to the word limit as practicable.
All symbols are of usual significance.

SECTION-A

1.   Answer any *five* questions from the following: 2×5 = 10

(a) What is the difference between conduction current and the displacement current?

(b) Define skin effect and skin depth.

(c) What is Brewster's angle?

(d) Define the characteristic impedance of a transmission line.

(e) Can a waveguide be viewed as a filer? Explain.

(f) What do you mean by lossless transmission line?

(g) Why TM_{01} and TM_{10} modes are not possible in rectangular waveguide?

(h) What do you mean by anomalous dispersion?

(i) Distinguish between phase velocity and group velocity.

SECTION-B

Answer any *six* questions from the following   5×6 = 30

2.   Establish Maxwell's equations for the propagation of electromagnetic wave in a conducting medium.

3. (a) Discuss the possible reasons for distortion in a transmission line.   3+2

(b) A distortionless transmission line has an inductance 1.2 mH/km and a capacitance of 0.05 µF/km. Calculate the characteristic impedance of the line.

4.   Explain the formation of standing wave pattern on a transmission line. A low loss transmission line of 100 Ω characteristic impedance is connected to a load of 200 Ω. Calculate the voltage reflection co-efficient and SWR.   2+3

5.   Derive Cauchy's dispersion formula on the basis of Electromagnetic theory.

6. Show that for a semi-infinite solid conductor, the skin depth δ is given by

$$\delta = \sqrt{\frac{2}{\omega\mu\sigma}}$$

7. Derive the expression for the reflection co-efficient for perpendicularly polarised wave when it is incident at an angle θ_i, on the interface.

8. What is waveguide? What are its advanatges over transmission lines? Define TM and TE modes.

9. An air-filled waveguide of inside dimension $a = 8$ cm and $b = 4$ cm, operates in the dominant TE_{10} mode. Calculate the cut-off frequency and the group velocity at a frequency of 4 GHz.

10. For a low loss transmission line, find the expressions for attenuation constant and phase constant.

11. A transmission line has characteristic impedance of $(100 + j0.01)\,\Omega$ and is terminated by a load of $(150 + j0.01)\,\Omega$. Calculate the reflection coefficient at the load end.

N.B. : *Students have to complete submission of their Answer Scripts through E-mail / Whatsapp to their own respective colleges on the same day / date of examination within* 1 *hour after end of exam. University / College authorities will not be held responsible for wrong submission (at in proper address). Students are strongly advised not to submit multiple copies of the same answer script.*

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