AR-19
M.TECH 1ST SEMESTER EXAMINATIONS NOV/DEC 2019
ECE, MPEEC1041
RF AND MICROWAVE CIRCUIT DESIGN

Time: 3 Hours   Max Marks : 70

The figures in the right hand margin indicate marks.

PART-A   (10 X 2=20 MARKS)

1. Answer the following questions.
   a) Define quarter wave transmission line.   **[2 X 10]**
   b) What do you mean by lumped parameter and distributed parameter network?
   c) Derive the formula for quality factor Q of the TE_{101} Cavity mode.
   d) What is S-Matrix? Write the S-Matrix of a circulator?
   e) What are the transmission line parameters?
   f) What are Telegraphers Equations?
   g) What is reflection coefficient? What is its range?
   h) Draw the diagrams of rectangular and circular waveguide with its parameters
   i) Determine the disc diameter of a strip resonator resonates at 5.2GHz and uses alumina having relative permittivity 9.8 as the dielectric substrate.
   j) What do you mean by oversized waveguide?

PART-B   (5 X 10=50 MARKS)

Answer any five questions from the following.

Q2.
   a) Derive the expression for voltage and current in a two wire parallel transmission line.
   b) Explain about isolator and circulator with proper diagram.

Q3.
   a) Explain with proper diagram about the IMPATT diode.
   b) Design a cylindrical cavity with length of the cavity equal to its diameter, with the TE_{011} mode resonating at 10 GHz. The cavity has silver plated walls ($\sigma = 6.1 \times 10^7$ S/m).Determine the Q of the Cavity .

Q4.
   a) What is standing wave? What are the parameters associated with it? How it is produced.
   b) A directional coupler has the coupling factor of 10 dB and a directivity of 30 dB. If the power in the isolated port is 40 µW, find the power in the input port and also in the through port. What is the insertion loss in the coupler?

Q5.
   a) Explain in detail about directional couplers and power dividers.
   b) Explain all the features of micro strip patch antenna with transmission line model.

Q6.
   a) Explain about the circuit waveguide with all its expressions.
   b) Consider an air filled cubical cavity (a=b=d) designed to be resonated in the TE_{101} mode at 12 GHz with gold plated surfaces (conductivity is 4.1×10^7 Siemens per meter). Find the quality factor.

Q7.
   a) Discuss the attenuation due to losses in rectangular waveguide.
   b) Derive the expressions for TE and TM modes for rectangular waveguide.

Q8.
   a) Explain about cavity resonator with proper expressions.
   b) Derive the expression for input impedance of a terminated transmission line. Find out the equation for short circuited transmission line.

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