Sixth Semester B.E. Degree Examination, June/July 2019
Microwaves and Radar

Time: 3 hrs.   Max. Marks:100

Note: *Answer any FIVE full questions, selecting*
at least TWO questions from each part.

PART – A

1 a. Derive an expression for reflection coefficient and transmission coefficient in the transmission line. **(10 Marks)**

   b. A 100 Ω coaxial line with air as dielectric is terminated by a load impedance of $75 + j40\Omega$ and is excited at 1 GHz by a matched generator. Find the position of SC shunt single matching stub of 100 Ω impedance on the line and determine the length of the stub. **(10 Marks)**

2 a. Derive electric and magnetic field equations in rectangular waveguide for TM_{mn} modes. **(08 Marks)**

   b. With a neat diagram, explain the operation of the following microwave devices:
   (i) Ferrite rotation isolator. (ii) Working of four port circulator. **(12 Marks)**

3 a. Explain the principles of operation of the GUNN diode with formation of Gunn domain. And also briefly, explain the modes of operation of the Gunn diode with Gunn-oscillation modes. **(08 Marks)**

   b. Explain the principle of operation of Read diode with suitable diagrams. **(06 Marks)**

   c. Draw the equivalent circuit diagram for parametric amplifier and explain. **(06 Marks)**

4 a. What are the different properties of scattering parameters? Explain briefly. **(08 Marks)**

   b. Explain the relation between incident and reflected waves in terms of scattering parameters for a two port network. **(06 Marks)**

   c. Define the following losses in a microwave network in terms of S-parameters:
   (i) Insertion loss (ii) Transmission loss (iii) Reflection loss (iv) Return loss **(06 Marks)**

PART – B

5 a. With a neat sketch, explain the operation of magic tee and mention its applications. **(10 Marks)**

   b. With a neat diagram, explain the operation of following microwave devices :
   (i) Precision type variable attenuator. (ii) Precision Rotary Phase shifter. **(10 Marks)**

6 a. Explain the operation of Microstrip lines and striplines with diagrams. **(08 Marks)**

   b. Explain the dielectric losses in microstrip lines. **(08 Marks)**

   c. Write short notes on coplanar striplines. **(04 Marks)**

7 a. Derive an expression for the basic form of Radar-Range equation and hence explain the factors influencing the maximum range of radar. **(08 Marks)**

   b. What are the applications of Radar? Explain each application briefly (4 applications any). **(06 Marks)**

   c. A radar is expected to detect a target of cross sectional area of 10 m^2. The antenna used is a parabolic dish of diameter 5 m. The radar operates at a wavelength of 10 cms and transmits peak pulse power of 0.2 megawatts. Receiver have minimum signal power of 10^{-13} watts. Find the maximum range of target can be detected. **(06 Marks)**

8 a. Explain the principle and working of MTI Radar with the help of block diagram. **(10 Marks)**

   b. Write explanatory notes on:
   (i) Single delay-line cancellers. (ii) Blind speeds with equations. **(10 Marks)**

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