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Fifth Semester B.E. Degree Examination, Dec.2013 / Jan. 2014
Microwave and Radar

Time: 3 hrs.

Max. Marks: 100

**Note: 1. Answer any FIVE full questions, selecting
atleast TWO questions from each part.
2. Use of Smith chart is permitted.**

PART - A

- 1 a. By considering elementary section of a transmission line derive transmission line equations. (08 Marks)
- b. Derive an expression for the line impedance of transmission line in terms of Z_s and Z_o . (05 Marks)
- c. A load impedance of $Z_R = 60 - j 80\Omega$ is required to be matched to a 50 ohm co - axial line, by using a short circuited stub of length ' ℓ ' located at a distance ' d ' from the load. The wavelength of operation is 1 meter. Using Smith chart, find ' d ' ' ℓ '. (07 Marks)
- 2 a. With a neat diagram, explain the working of a two hole directional coupler. Also derive the scattering matrix of the same. (10 Marks)
- b. With neat diagram, explain the operation of a Faraday rotation isolator. (10 Marks)
- 3 a. What is 'Gunn Effect'? With a neat diagram explain the constructional details of a Gunn diode. (08 Marks)
- b. Give a brief account of RWH theory. (06 Marks)
- c. With neat diagram, explain the construction and operation of Schottky barrier diode. (06 Marks)
- 4 a. Explain S - matrix representation of multiport network. (07 Marks)
- b. Explain symmetrical Z and Y matrix for reciprocal network. (08 Marks)
- c. Explain symmetric properties of S - matrix. (05 Marks)

PART - B

- 5 a. With a neat diagram, explain the working of a precision type phase shifter. (10 Marks)
- b. With a neat diagram, explain the working of a H - plane Tee junction. Also derive its scattering matrix. (10 Marks)
- 6 a. Calculate the characteristic impedance of a wide microstrip line having negligible thickness and having a width at 0.8mm, thickness at substrate 0.2mm and has a dielectric constant 3.55. (04 Marks)
- b. Explain the various losses taking place in microstrip lines. (08 Marks)
- c. With a neat diagram, explain shielded strip lines. (08 Marks)
- 7 a. Derive radar range equation in terms of effective aperture, radar cross section of target and minimum detectable signal power of receiver. (10 Marks)
- b. Discuss various applications of radar. (05 Marks)
- c. What is meant by minimum detectable signal power of receiver? (05 Marks)
- 8 a. Explain the MTI radar, with neat block diagram. (10 Marks)
- b. With neat block diagram, explain moving target detector. (05 Marks)
- c. A Doppler radar set operates at 12 GHz and is used for traffic speed measurement, what are Doppler frequencies for the speed of 40Kmph and 100 kmph. (05 Marks)