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Fifth Semester B.E. Degree Examination, June/July 2014
Microwaves and Radar

Time: 3 hrs.

Max. Marks:100

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

PART – A

- 1
 - a. Derive an expression for reflection coefficient and transmission coefficient in the transmission line. (08 Marks)
 - b. Derive the relationship between SWR and reflection co-efficient. (06 Marks)
 - c. A telephone line has $R = 6$ ohms/km, $L = 2.2$ mh/km, $C = 0.005$ μ f/km and $G = 0.05$ μ mhos/km. Determine z_0 , α , β and phase velocity at 1 kHz. (06 Marks)
- 2
 - a. Derive the field equation for TE modes in rectangular waveguide. (10 Marks)
 - b. A rectangular air filled copper waveguide with dimension 0.9×0.4 inch cross section and 12 inch length is operated at 9.2 GHz with a dominant mode. Find: i) Cutt-off frequency; ii) Guide wavelength; iii) Phase velocity; iv) Characteristic impedance; v) The loss. (10 Marks)
- 3
 - a. With a neat sketch, explain the TRAPATT diode and draw its characteristics. (10 Marks)
 - b. Explain the parametric amplifier with equivalent circuit. Give the advantages of parametric amplifier. (10 Marks)
- 4
 - a. Explain symmetrical z and y matrices for reciprocal network. (06 Marks)
 - b. Which properties are common in s, z and y matrices? (06 Marks)
 - c. Derive an expression of the input reflection coefficient of a two port network with mismatched load. (08 Marks)

PART – B

- 5
 - a. Explain with a neat sketch a precision phase shifter. (10 Marks)
 - b. With a neat sketch, explain the operation of magic tee. Also obtain the S matrix representation of the magic tee. (10 Marks)
- 6
 - a. Briefly explain dielectric losses, ohmic losses and radiation losses in microstrip lines. (10 Marks)
 - b. With a neat diagram, explain the operation of parallel strip line. Write the expression for distributed parameters, characteristic impedance and attenuation losses. (10 Marks)
- 7
 - a. Derive the simple radar range equation starting from the power density of isotropic antenna. (08 Marks)
 - b. Calculate the maximum range of a radar system which operates at 3cm with a peak pulse power of 600kW if its minimum receivable power is 10^{-3} W, the capture are of its antenna is 5m^2 and the radar cross sectional area of the target is 20m^2 . (05 Marks)
 - c. What are the applications of radar? (07 Marks)
- 8
 - a. Explain single delay line canceller and frequency response of the single delay line canceller. (10 Marks)
 - b. With neat block diagram, explain the operation of MTI Doppler signal processor. (10 Marks)

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