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**Question Paper Code : 51418**

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2014.

Seventh Semester

Electronics and Communication Engineering

EC 2403/EC 73/10144 EC 703 — RF AND MICROWAVE ENGINEERING

(Regulation 2008/2010)

(Common to PTEC 2403 – RF and Microwave Engineering for B.E. (Part-Time)  
Sixth Semester Electronics and Communication Engineering – Regulation 2009)

Time : Three hours

Maximum : 100 marks

Smith chart is to be provided.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. List any four reasons for the wide use of RF.
2. Give the relationship between [s] and [z].
3. Define Stability.
4. What are the needs for impedance matching networks?
5. What are the factors that reduce the efficiency of IMPATT diode?
6. What is negative resistance in Gunn diode?
7. What are matched terminators?
8. What are ferrites? Why is it needed in circulators?
9. What are the errors in impedance measurement?
10. Define : Convection current of TWT.

PART B — (5 × 16 = 80 marks)

11. (a) With the help of S matrix concept prove the following properties.
  - (i) Symmetry
  - (ii) Unity
  - (iii) Zero and
  - (iv) Phase shift.

(4 × 4 = 16)

Or

- (b) (i) When do you prefer transmission matrix? Obtain the ABCD matrix of a transformer with turns ratio of  $N : 1$ . (8)
- (ii) The impedance matrix of a certain lumped element network is given by  $[Z_{ij}] = \begin{bmatrix} 4 & 2 \\ 2 & 4 \end{bmatrix}$ . Determine the equivalent scattering parameter matrix  $[S_{ij}] = \begin{bmatrix} S_{11} & S_{12} \\ S_{21} & S_{22} \end{bmatrix}$  for the  $[Z_{ij}]$ . (8)
12. (a) Design a matching network to match a  $Z_L = (10 + j10)\Omega$  to a  $50\Omega$  line. Specify the values of L and C at frequency of 1GHz. (Use smith chart). (16)
- Or
- (b) Derive expressions for the following of a micro stripline matching network.
- (i)  $w/h$  ratio and
- (ii) Total Q factor ( $Q_T$ ). (8 × 2 = 16)
13. (a) (i) Draw and explain the operation of Magic Tee. Explain its application in the construction of a 4 - port circulator. (8)
- (ii) Find the directivity in dB for a coupler if same power is applied in turn to input and output of the coupler with output terminated in each case in a matched impedance. The auxiliary output readings are 450 mW and 0.710  $\mu$ W. (8)
- Or
- (b) Draw and explain the various types of attenuators and phase shifters. What is a gyrator? (16)
14. (a) (i) Explain the operating principle of a Gunn diode. Describe its domain formation and various modes of operations. (8)
- (ii) Explain the operating principles of varactor and step recovery diodes. (8)
- Or
- (b) What are the materials used for MMIC fabrication? Explain with neat diagrams the fabrication process of MMICs. (16)
15. (a) Explain the launching process of a two - cavity klystron and derive expression for its optimum bunching distance  $L_{opt}$ . (16)
- Or
- (b) (i) Describe the measurement of power at microwave frequencies in detail. (8)
- (ii) Explain the procedure to measure the impedance of a load. (8)