2016/ODD/12/33/ETC–503/613

**B.Tech Odd Semester (CBCS) Exam.,
December—2016**

ELECTRONICS AND TELECOMMUNICATION ENGINEERING

(5th Semester)

Course No. : ETC-503

(Microwave Engineering)

Full Marks : 75
Pass Marks : 30

Time : 3 hours

Note : 1. Attempt **five** questions, selecting **one** from each Unit.
2. Begin each answer in a new page.
3. Answer parts of a question at a place.
4. Assume reasonable data wherever required.
5. The figures in the margin indicate full marks for the questions.

UNIT—I

1. *(a)* What is a transmission line theory? Sketch and briefly explain the various types of transmission line used in transmission line theory. 1+8=9

(b) What is transit time effect? Briefly explain about transit time effect. 1+5=6

2. *(a)* Derive the equations of reflection and transmission coefficients and for different load conditions. Find the corresponding values of reflection and transmission coefficients. 10

(b) Derive the relationship given below : 5

$$1 \quad {}_L^2 \quad \frac{Z_O}{Z_L} T_L^2 \quad \text{or} \quad Z_L(1 \quad {}_L^2) \quad Z_O T_L^2$$

UNIT—II

3. *(a)* Explain microwave linear beam tube. Draw the classification chart of microwave linear beam tube. 6

(b) Describe the construction and operation of two-cavity klystron with a neat sketch using Apple gate diagram. 9

4. *(a)* Draw the classification chart of cross-field tube. 3

(b) What is a magnetron? Classify the categories of magnetron. 3

(c) What is -mode operation of magnetron? Describe the construction and working of cavity magnetron. 9

UNIT—III

5. *(a)* What are the drawbacks of microwave solid-state diodes and transistors? Classify microwave solid-state devices. 3+4=7

(b) What is heterojunction bipolar transistor? Describe in detail about heterojunction bipolar transistor. 8

6. *(a)* What is transferred electron device? Briefly explain about Gunn diode. 2+5=7

(b) Write short notes on the following : 4×2=8

(i) IMPATT

(ii) TRAPATT

UNIT—IV

7. *(a)* Derive the impedance and admittance parameters of *N*-port microwave network. 8

(b) What is scattering matrix? Derive the S parameters of two-port network with mismatched loads. 7

8. What are waveguide corners, bend and twist? Draw the structure of E-plane, H-plane and Magic Tee, and explain the working principle of Magic Tee. Derive the *s*-matrix of Magic Tee. 5+3+2+5=15

UNIT—V

9. *(a)* What is an insertion loss? 1

(b) Draw the experimental set-up to measure insertion loss and attenuation. 2

(c) Describe the measurement of insertion loss and attenuation of a DUT. 10

(d) During the measurement, what are the careful steps should be taken? 2

10. *(a)* Briefly explain the experimental set-up to measure VSWR with suitable diagram. 3

(b) Describe a suitable method to measure a low VSWR produced by a DUT. 5

(c) What are the precautions that should be taken while carrying out the measurement of low VSWR? 7

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