

1

Government College of Engineering, Aurangabad
(An Autonomous Institute of Government of Maharashtra)

B.E. (ECT) Examination

End semester Examination, Nov-Dec 2016

NOV 2016

ET443: Microwave Engineering

Time: Three Hours

Max. Marks: 60

"Verify the course code and check whether you have got the correct question paper"

N.B.:-

1. All Questions are compulsory
2. Figures to the right indicates full marks
3. Assume suitable data if necessary and state it clearly
4. Use of non-programmable calculator is allowed

I Attempt all

12

- (a) Discuss the following terms
- | | |
|----------------------|---------------------------|
| (i) Wavelength | (ii) Phase Velocity |
| (iii) Group Velocity | (iv) Propagation constant |

OR

An air filled rectangular waveguide of inside dimensions 7 x 3.5 cm operates in the dominant mode TE₁₀. Find cut off frequency, phase velocity, guided wavelength of the wave in the guide at a frequency of 3.5 GHz.

- (b) Explain S-matrix representation of multiport network.

OR

A Three port circulator has an insertion loss of 1 dB, isolation 30 dB and VSWR=1.5. Find the S matrix.

II Attempt any two questions

12

- (a) Explain the characteristics of Magic Tee and derive the S-matrix and mention its application.
- (b) Two directional couplers (20 dB) are used in a guide to sample the incident and reflected powers. The outputs of the two couplers are 3MW and 0.1 MW respectively. What is the value of VSWR in the main waveguide and the value of reflected power?
- (c) Define the following in terms of S- parameters: a) Insertion loss b) transmission loss c) Reflection Loss d) return Loss

III Attempt any two questions

12

- (a) Write a Short note on Applegate diagram of two cavity klystron amplifier.
- (b) Mention the four modes of operation for Gunn diode. Explain briefly the Gunn oscillation mode.
- (c) An IMPATT diode has the following parameters:

Carrier drift velocity: $v_d = 2 \times 10^7 \frac{cm}{s}$

Drift region length: $L = 6 \mu m$

Maximum operating voltage: $V_{omax} = 100 V$

Maximum operating current $I_{omax} = 200 mA$

Efficiency: $\eta = 15\%$

Breakdown voltage $V_{bd} = 90 V$

Compute: (a) The maximum CW output power in watts.

(b) The resonant frequency in gigahertz.

IV Attempt any two questions**12**

- (a) Describe the methods of impedance measurement using slotted line.
- (b) Use double minimum method to evaluate the VSWR of a waveguide transmission system which is operating at 10 GHz. Inside dimensions of waveguide are $a=4$ cm and $b=2$ cm. Distance between twice minimum power points is 1mm on a slotted line.
- (c) Describe the electronic techniques of microwave frequency measurement.

V Attempt any two questions**12**

- (a) Write a Short note on micro strip line. What are the losses in microstrip lines?
- (b) Calculate the beamwidth between nulls and power gain of a 2-m paraboloid reflector used at 6 GHz.
- (c) Write a short on parabolic reflector.