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EC - 604

B.E. VI Semester

Examination, December 2012

Microwave Engineering

Time : Three Hours

Maximum Marks : 100

Minimum Pass Marks :35

- Note : *www.rgpvonline.in*
1. Attempt any one question from each Unit.
 2. All questions carry equal marks.
 3. Assume suitable data if found missing.

UNIT - I

- 1) What is a dominant mode and degenerate mode? Discuss power transmission and power losses in a rectangular wave guide? What are the techniques for excitations of modes in a rectangular wave guide? An air - filled rectangular wave guide has dimensions $a = 6$ cm and $b = 4$ cm. The signal frequency is 3 GHz. Compute the following for the TE_{10} mode:
 - a) Cut off frequency
 - b) Wavelength in waveguide
 - c) Phase constant and phase velocity in the waveguide.
 - d) Group velocity and wave impedance in the waveguide.

OR

- 2) Explain the following :
 - a) strip lines
 - b) Microstrip lines.

A shielded strip line has the following parameters:

Dielectric constant of the insulator

(Polystyrene) : $\epsilon_r = 2.56$

Strip width: $w = 25$ mils

Strip thickness: $t = 14$ mils

Shield depth $d = 70$ mils

Calculate:

- a) The k. factor
- b) The fringe capacitance
- c) The characteristic impedance of the line

What are the various losses in Microstrip lines: Derive quality factor Q of microstrip lines.

UNIT - II

- 3) Discuss principle of operation and properties of E - plane Tee. Derive S-matrix for it.

OR

- 4) Write a detailed note on the following :

- a) Ferrites www.rgpvonline.in
- b) Hybrid T
- c) Rectangular cavity Resonator and equations for resonant frequency and quality factor.

UNIT - III

- 5) What is a parametric amplifier? How is it different from a

normal amplifier? State Manley-Rowe relations as applied to parametric amplifiers; What are the conditions for parametric up converter and down converter? Discuss the amplification mechanism of a parametric amplifier by use its equivalent circuit? Briefly explain

- i) Degenerate para amp.
- ii) Non-degenerate para amp.
- iii) Broadband para amp.
- iv) Cooled para amp.

OR

- 6) Write a detailed note on the following:
- a) P-I-N diodes
 - b) Microwave detector diodes
 - c) Varactor Diodes
 - d) TRAPATT

UNIT - IV

- 7) What are cross-field devices? How does a magnetron sustain its oscillations using this cross-field? How is bunching achieved in accenity magnetron? Explain the phase focussing effect? What is strapping in magnetron? Derive an expression for the cut-off magnetic field (flux) density with reference to a cylindrical magnetron.

OR

- 8) Explain Reflex Klystron under the following points:
- a) Construction and schematic diagram
 - b) Operation

- c) Operating characteristics
- d) Mathematical Analysis

UNIT - V

- 9) Explain the double minimum method of measuring VSWR?
Explain VSWR meter and slotted line arrangement?

OR

- 10) Discuss Microwave frequency measurement techniques?
Explain Broad-band and tuned detectors. What is square-law detection.

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