Code: 13A04603

R13

B.Tech III Year II Semester (R13) Regular Examinations May/June 2016
MICROWAVE ENGINEERING
(Electronics and Communication Engineering)

Time: 3 hours   Max. Marks: 70

PART – A
(Compulsory Question)
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1   Answer the following: (10 X 02 = 20 Marks)
  (a)   Write short notes on dominant and degenerated modes in rectangular waveguides.
  (b)   Define: (i) Phase velocity. (ii) Group velocity.
  (c)   What is the significance of S-Matrix?
  (d)   Write a short note on Faraday rotation.
  (e)   List the applications of two cavity klystron amplifier.
  (f)   What is slow wave structure?
  (g)   Write a short note on negative resistance and cavity magnetrons.
  (h)   List the applications of Gunn diode.
  (i)   Define: (i) VSWR. (ii) Attenuation.
  (j)   Write short note on slotted line section.

PART – B
(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2   (a)   Explain the propagation of TM waves in rectangular wave guides with field components.
    (b)   A rectangular waveguide with dimension of 3×2 cms operates in TM_{11} mode at 10 GHz. Determine the characteristic wave impedance.
OR
3   (a)   Explain the quality factor of cavity resonator
    (b)   For the dominant mode of operation in an air filled circular waveguide of inner diameter 4 cms. Find: (i) Cut off wavelength. (ii) Guided wave length. (iii) Cut off frequency.

UNIT – II

4   (a)   Derive the scattering matrix of E-H plane tee junction.
    (b)   Explain about: (i) Coupling probe. (ii) Coupling loop.
OR
5   (a)   Explain construction details and operation of isolator.
    (b)   Derive the scattering matrix of directional coupler.

UNIT – III

6   Draw the structure and explain the velocity modulation process in two cavity klystron amplifier.
OR
7   (a)   Explain output power and efficiency in reflex klystron.
    (b)   With neat diagram explain the operation of helix TWT.

UNIT – IV

8   (a)   An X-band pulsed conventional magnetron has the following parameters. Anode voltage V_o = 5.5 KV, Beam current I_0 = 4.5 A, Operating frequency f = 9×10^9 Hz, Resonant conductance G_r = 2×10^{-4} mho, Loaded conductance G_l = 2.5×10^{-5} mho, Vane capacitance C = 2.5 PF. Compute: (i) Angular resonant frequency. (ii) Unloaded quality factor. (iii) Loaded quality factor.
    (b)   Explain the following Gunn diode oscillation modes: (i) LSA mode. (ii) Quenched mode.
OR
9   (a)   Explain the construction and equivalent circuit details of VARACTOR diode
    (b)   In a Gunn diode with active length of 20μm, the drift velocity of electrons is 2×10^7 cm/s. Calculate the rational frequency and critical voltage of the diode.

UNIT – V

10 (a)   Explain the description of microwave bench.
    (b)   Explain the medium microwave power measurement with neat diagram.
OR
11 (a)   Explain the double minimum method of measuring VSWR.
    (b)   Explain the impedance measurement using Reflectometer.

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