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BIEL-016

B.Tech. ELECTRONICS AND COMMUNICATION ENGINEERING (BTECVI)

00874

Term-End Examination

June, 2014

BIEL-016 : MICROWAVE AND RADAR ENGINEERING

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any* ***seven*** *questions. Use of scientific calculator is allowed. Make suitable assumption if required.*

1. (a) Explain non-existence of TEM mode in waveguide. *5*

(b) Define TEM, TE, TM waves. *5*

2. An air-filled rectangular waveguide has dimensions of 2 cm × 3 cm. The maximum RMS electric field in the waveguide is 100 V/m at frequency of 6 GHz. The waveguide is terminated in a matched load.

Calculate

(i) Characteristics wave impedance of the dominant mode

(ii) Guide wavelength

(iii) Group velocity

(iv) Power propagation in the guide *10*

3. Explain the working of a Magic " T " giving its scattering matrix and also explain the construction and properties of a Magic " T " and their application. *10*

4. Explain a microwave resonator and obtain expression for frequency of a rectangular resonator. *10*

5. (a) Calculate the SWR of a transmission system operating at 10 GHz. Assume TE_{10} wave transmission inside a waveguide of dimensions a = 4 cm, b = 2·5 cm. The distance measured between twice minimum power point = 1 mm on a slotted line. *4*

   (b) Explain the various methods of the measurement of microwave power. *6*

6. (a) Explain the working of a Reflex-Klystron oscillator. *5*

   (b) What are the avalanche transmit time devices ? Explain the construction and operation of IMPATT diode and also discuss its disadvantages and applications. *5*

7. (a) How do you distinguish stationary target and moving targets ? Explain the principle and working of an MTI Radar. *6*

   (b) An MTI Radar operates at 4·8 GHz with a PRF of 600 Hz. Calculate the lowest two blind speed of this radar. *4*

8. (a) A radar transmitter has peak pulse power of 400 kW a PRF of 1500 PPS and a pulse width of 0·8 μ sec.

Calculate

(i) The maximum unambiguous range

(ii) Duty cycle

(iii) The average power transmitted *5*

(b) Derive the Radar range equation. Explain the factors that affect the maximum range of the radar. *5*

9. (a) What is a pulse radar receiver ? Explain all the stages of a pulse radar receiver and what limits the sensitivity of a radar receiver. *6*

(b) With a continuous transmit frequency of 5 GHz, calculate the Doppler frequency seen by a stationary radar when the target radial velocity is 100 km/hour ? *4*

10. Write short notes on any ***two*** of the following : *2×5=10*

(a) Duplexer

(b) Monopulse tracking

(c) Tunnel diode
