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Question Paper Code : 80352

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Seventh Semester

Electronics and Communication Engineering

EC 6701 — RF AND MICROWAVE ENGINEERING

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. List the radio frequency bands available in microwave and radio frequency ranges.

2. Define S-parameters.

3. Define Noise figure.

4. Calculate VSWR of an amplifier, if the amplifier has reflection coefficient 0.2533.

5. Compare PIN and PN diode.

6. What is isolator? And why isolators are called uniline?

7. What is magnetron?

8. What is Tetrodes and Pentodes?

9. What is network analyzer?

10. Classify microwave powers with its range.

PART B — (5 × 16 = 80 marks)

11. (a) (i) What is transmission (T) matrix? Obtain and explain the relationship with [S] and vice versa. (8)

(ii) Compute the intrinsic wave impedance, phase velocity and wavelengths of an electromagnetic wave in free space and a printed circuit board (PCB) material whose dielectric constant is 4.6 for the frequency f = 30 MHz and 3 GHz. (8)

Or

(b) (i) Explain and analyze any reciprocal lossless network with derivation. (10)

(ii) Discuss on the application of RF and microwave area. (6)

12. (a) Derive the equation for power gain, available power gain and transducer power gain. (16)

Or

(b) Investigate the stability regions of a transistor whose S-parameters are recorded as follows :

$S_{12} = 0.2\angle -10°$; $S_{11} = 0.7\angle -70°$; $S_{21} = 5.5\angle 85°$ and $S_{22} = 0.7\angle -45°$ at 750 MHz. (16)

13. (a) Discuss briefly about working principle, operation, characteristics and application of varactor diode. (16)

Or

(b) What is circulator? With neat diagram, explain the working principle, construction, operation of four-port circulator using magic-tee. Verify the circulator theory with necessary S-parameter equations.

14. (a) Explain the working principle and operation of multi-cavity Klystron amplifier and derive the expressions for its output power. (16)

Or

(b) A travelling wave tube (TWT) operates under the following parameters :

Beam Voltage $V_0 = 3$ kV

Beam Current $I_0 = 30$ mA

Characteristic impedance of helix $= Z_0 = 10\ \Omega$

Circuit length = $N = 50$ m

Frequency $f = 10$ GHz

Determine :

(i) Gain parameters C.

(ii) Output power gain A_p in decibels.

(iii) All four propagation constants. (16)

15. (a) Explain the impedance measurement technique using slotted line and reflectometer. (8 + 8)

Or

(b) Explain the measurement of high VSWR with the help of block diagram. (16)
