Code No: R32042 **R10** **Set No: 1**

III B.Tech. II Semester Supplementary Examinations, January -2014

MICROWAVE ENGINEERING

(Electronics and Communication Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

*****

1. (a) What are the various applications of Microwaves? [5+5+5]
   (b) Sketch the Field lines of Rectangular waveguide for TE_{10} and TM_{20} modes.
   (c) Derive the equation for impedance of a Rectangular waveguide in TE mode.

2. (a) Derive the expressions for the field components Ey, Hx and Hy of rectangular cavity. [8+7]
   (b) Draw the structure of Microstrip line and find its characteristic impedance?

3. Explain the following microwave components: [5+5+5]
   (a) Coupling mechanisms (b) waveguide attenuators (c) waveguide Phase shifters

4. (a) How the Ferrites are used in Isolators? Explain any one of such an Isolator with neat sketches. [8+7]
   (b) Derive the S-matrix of Magic Tee and write its applications.

5. (a) What are the advantages of Reentrant Cavities? How these are used in Two Cavity Klystrons?
   (b) Draw the output power characteristics of Reflex Klystron and explain how oscillating modes are formed.
   (c) Explain the Electronic tuning in Reflex Klystron and compare it with Mechanical tuning. [5+5+5]

6. (a) What are the different types of slow wave structures? What are the different characteristics of them.
   (b) Explain how the Cross-field is used to obtain oscillations in Magnetrons? [7+8]

7. (a) How Gunn diode is used as a oscillator? Explain its working with suitable diagram.
   (b) Draw the characteristics of TRAPATT Diode and explain it. [8+7]

8. (a) What type of precautions has to be considered while measuring parameters at Microwave frequencies?
   (b) Explain the method of measurement of High and Low VSWR at Microwave frequencies. [5+10]

*****

Code No: R32042 **R10** **Set No: 2**

III B.Tech. II Semester Supplementary Examinations, January -2014

MICROWAVE ENGINEERING

(Electronics and Communication Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

*****

1. (a) Derive the Equations for Electric Fields of Rectangular Waveguide in TE mode .
   (b) Calculate the cutoff frequencies of air-filled WR-90 guide for the TE_{10},TE_{20},TM_{11}. [9+6]
2. (a) Draw the electromagnetic field patterns for the TE_{101} mode in a rectangular cavity.
   (b) How to prevent radiation losses in micro strip lines?
   (c) Define the effective dielectric constant of the Micro strip line. Write its expression. [5+5+5]
3. (a) Explain the function of the following waveguide components:
   (i) Irises (ii) Tuning Screws (iii) Posts (iv) Matched loads.
   (b) Explain how the Magic Tee used as a Duplexer ? [8+7]
4. (a) Derive the S-matrix of H-plane Tee.
   (b) How a circulator can be used as an Isolator?
   (c) What is Gyrator? How it works? [5+5+5]
5. (a) Explain how velocity modulation converts into current modulation in Two Cavity Klystron amplifier? [8+7]
   (b) Derive the expression for Electronic Admittance of Reflex Klystron Oscillator?
6. (a) Explain the amplification process in TWT with suitable structural diagram.
   (b) How to separate a π – mode in Magnetrons?
   (c) How to suppress an oscillations in TWT? [7+4+4]
7. (a) What are the different modes of operation for a Gunn diode? Explain them
   (b) Draw the characteristics of IMPATT diode and explain them. [8+7]
8. (a) Draw the basic Bench Setup for Microwave measurements and explain the significance of each component. [8+7]
   (b) How the Microwave Power can be measured? Explain any one of such method.

*****

Code No: R32042 **R10** **Set No: 3**

III B.Tech. II Semester Supplementary Examinations, January -2014

MICROWAVE ENGINEERING

(Electronics and Communication Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

*****

1. (a) Why TEM mode cannot exist in a Rectangular Waveguide?
   (b) Calculate the attenuation constant at 6 GHz for an air-filled, 2 X 4 cm rectangular guide.
   (c) Derive the equation for characteristic impedance of rectangular waveguide in TM mode. [5+5+5]

2. (a) Draw the attenuation characteristics of air-filled circular wave guide in TE_{01} mode compare the operation of it with other modes.
   (b) Define the unloaded Q of the rectangular cavity and derive its expression. [7+8]

3. (a) Explain the working of Rotary Vane type Phase shifter with neat sketch.
   (b) A matched generator ($Z_G=Z_O$) with an available power of one watt is connected to the H arm of a magic tee. The E arm is match terminated and the length of the coplanar arms are the same. Calculate the power delivered to the terminations at ports 1,2 and 3 and the power reflected at port 4 when ports 1 and 2 are terminated in the following manner :
   $Z_{L1} = 2.4\ Z_0$ and $Z_{L2} = 0.6\ Z_0$. [8+7]

4. (a) Explain the working of circulator based on the principle of Faraday rotation.
   (b) Prove that $|S_{13}| = |S_{24}|$ and $|S_{14}|=|S_{23}|$ in an ideal Directional Coupler. [8+7]

5. (a) How Microwave tubes are classified? Give them with examples. [4+4+7]
   (b) How the frequency of oscillations is changed in Reflex klystron Oscillator?
   (c) Explain the process of Bunching in Reflex Klystron with applegate diagram.

6. (a) Derive the expression for Gain of TWT. [7+8]
   (b) Explain the principle of working of 8-Cavity Cylindrical Travelling wave Magnetron.

7. (a) What are the Transferred Electron Devices? Write applications of them. [7+8]
   (b) Explain the principle of working of IMPATT diode with suitable band structure.

8. (a) How the Q of the Cavity can be measured at Microwave frequencies?
   (b) Explain the Bolometer method of power measurement . [8+7]

*****

Code No: R32042 **R10** **Set No: 4**

III B.Tech. II Semester Supplementary Examinations, January -2014

MICROWAVE ENGINEERING

(Electronics and Communication Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

*****

1. (a) Derive the equations for Electric Fields of Rectangular Waveguide in TM mode.
   (b) Calculate the cutoff frequencies for TE_{11} , TE_{20} and TM_{20} modes for a 1X4 cm rectangular guide is loaded with a 0.2cm wide dielectric having ε_R=9. [9+6]

2. (a) Sketch the E & H field lines of circular waveguide in TE_{11}, TE_{21} and TM_{01} modes.
   (b) A rectangular cavity resonates in the TM_{111} mode at 5 GHz. Given a=8cm and b=6 cm, Calculate the resonant frequencies for the TE_{101}, TE_{102} and TE_{111} mode. Assume an air-filled cavity. [7+8]

3. (a) What are the different types of Attenuators? Explain their operation with suitable diagrams.
   (b) A 25W signal is incident on port 2 of a directional coupler. Calculate the power out of ports 1 and 4 if the coupling is 33dB and the directivity is 24dB.
   (c) Draw the structure of E-Plane Tee and write its properties. [7+4+4]

4. (a) What is Faraday Rotation? How it is used for Isolation?
   (b) Derive the S-matrix for Directional Coupler. Write the applications of Directional coupler. [8+7]

5. (a) What are the limitations of conventional tubes at microwave frequencies? How to overcome them?
   (b) Determine the expression for output power and efficiency of Two cavity klystron amplifier. [7+8]

6. (a) What are the Four Propagation Constants? Discuss the nature of them.
   (b) Derive the expression for Hull Cut-off condition in 8 cavity Cylindrical Magnetron. [7+8]

7. (a) Draw the V-I characteristics of Gunn Diode and explain how negative resistance region is obtained?
   (b) Explain the working of TRAPATT diode with suitable band structure. [8+7]

8. (a) What is Slotted Section? How it is used in Microwave Measurements?
   (b) How the attenuation of any Microwave component is measured? [7+8]

*****