Code :R7320405 1

III B.Tech II Semester(R07) Regular & Supplementary Examinations, April/May 2011
MICRO WAVE ENGINEERING
(Electronics & Communication Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE questions
All questions carry equal marks

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1. Deduce the electromagnetic field relations for the dominant mode in a rectangular waveguide from the Maxwell's equations.
2. Derive the TM wave field expressions for cylindrical waveguide.
3. (a) Explain the working of two hole directional coupler with a neat diagram.
   (b) Discuss about E plane Tee with appropriate schematic diagram. Why is it called as series Tee?
4. What are the advantages of scattering matrix representation over impedance and admittance matrix representations?
5. Explain clearly the different high frequency effects in electron tubes and show how these are eliminated in the design of a high frequency microwave tubes.
6. (a) Why pi-mode operation is preferred in cylindrical type magnetron. Give its working principle with neat sketches.
   (b) What is mode jumping? Discuss about various methods to avoid mode jumping in magnetrons.
7. (a) Draw the equivalent circuit of Schottky diode and write down its properties.
   (b) Draw the equivalent circuit of a pin diode and show how it can be used as transmission type switched line phase shifter and as a series switch.
8. Explain with a neat black diagram how VSWR and impedance can be measured using a slotted line in X band. Name the types of sources used and list out the precautions to be taken.

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Code :R7320405 **2**

III B.Tech II Semester(R07) Regular & Supplementary Examinations, April/May 2011
MICRO WAVE ENGINEERING
(Electronics & Communication Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE questions
All questions carry equal marks

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1. (a) Prove that the wave propagating through reflections in a rectangular waveguide is a combination of two uniform plane waves.
   (b) Discuss about the field distribution of TM waves in a rectangular waveguide.
2. Obtain the TE wave field expressions for cylindrical waveguide.
3. (a) Draw a neat sketch of magic T-junction. Imagine that a source is connected to arm 'P', and arm 'S' is match terminated. Arms 1 and 2 are terminated in reflection coefficients of 0.2 and 0.3 respectively. What is the VSWR seen by the source?
   (b) Draw schematic diagram for hybrid ring and explain its principle of operation and properties.
4. (a) What are ferrites? List out their characteristics.
   (b) What are scattering parameters? Explain the S matrix of a three port ideal circulator.
5. (a) Explain the amplification mechanism in two cavity Klystron amplifier.
   (b) Derive suitable expression for optimum length between buncher and catcher cavities of a two cavity Klystron amplifier.
6. Derive the expression for the gain of TWT amplifier from the convection current.
7. (a) Draw the characteristics of IMPATT diode under reverse bias condition and explain its principle of operation.
   (b) Write down the advantages and limitations of parametric amplifiers.
8. (a) Explain how you measure VSWR for all kinds of loads possible.
   (b) Give the microwave bench set up to measure wavelength of a given signal.

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Code :R7320405 **3**

III B.Tech II Semester(R07) Regular & Supplementary Examinations, April/May 2011
MICRO WAVE ENGINEERING
(Electronics & Communication Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE questions
All questions carry equal marks

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1. (a) Draw the field patterns of the dominant mode in a rectangular waveguide.
   (b) Derive the expression for the cutoff frequency of the same mode.
2. Discuss about attenuation due to conductor loss for various modes in cylindrical waveguide as a function of frequency.
3. (a) Sketch a 4 port hybrid junction. Justify that it is basically a 3 dB directional coupler.
   (b) A 20-mW signal is fed into the series arm of a loss less hybrid Tee junction. Calculate the power delivered through each port when other ports are terminated in matched load.
4. Write short notes on
   (a) Properties of S matrix,
   (b) Gyrator and its applications.
5. (a) Classify the O type and M type tubes. Give the important differences of these tubes in respect of their principle of operation and applications.
   (b) Draw the electronic admittance spiral of Reflex Klystron and explain its importance.
6. What is mode jumping? Explain it by deriving frequency expression for different modes of operation. How do you avoid it in a magnetron? Discuss at least one method.
7. (a) Define Gunn Effect. List the differences between microwave transistor and TED devices.
   (b) What is the necessary condition for an IMPATT to produce oscillations?
8. Give the measurement procedure for Q factor of a resonant cavity, and attenuation constant at microwave frequencies.

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Code :R7320405 4

III B.Tech II Semester(R07) Regular & Supplementary Examinations, April/May 2011
MICRO WAVE ENGINEERING
(Electronics & Communication Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE questions
All questions carry equal marks

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1. Deduce the expressions for guide wavelength and wave impedance of TE and TM modes of rectangular waveguide.
2. (a) Give the comparison between rectangular and cylindrical waveguides.
   (b) Determine the ratio of the cross section of a circular waveguide to that of a rectangular one if each is have the same cutoff wavelength in their dominant mode. Comment on the result.
3. (a) Explain how a magic Tees can be used for a four port circulator configuration with neat sketches.
   (b) Draw the H-plane Tee junction and explain its properties.
4. (a) Explain the operation of Faraday rotation isolator and give its applications.
   (b) Discuss the principle and applications of a gyrator.
5. (a) Draw the electronic admittance diagram of reflex klystron and explain its importance.
   (b) Give the principle of operation of a reflex Klystron oscillator and derive an expression for the bunching parameter.
6. Explain the amplification mechanism in a TWT amplifier. Derive the wave modes of a helix type traveling wave tube.
7. List out and explain different modes of a Gunn diode.
8. (a) Explain the method to measure reflection co-efficient.
   (b) Describe the measurement of impedance using slotted line and Smith chart.

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