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Paper Id:

131631

Sub Code: NEC 601

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B TECH
(SEM-VI) THEORY EXAMINATION 2017-18
MICROWAVE ENGINEERING

Time: 3 Hours

Total Marks: 100

- Note: 1. Attempt all Sections.
2. Assume any missing data.

SECTION A

1. Attempt *all* questions in brief. 2 x 10 = 20
- Why TEM mode cannot exist in Rectangular waveguide.
 - Differentiate dominant and degenerative mode in waveguide.
 - Define S Matrix.
 - Give the difference between Isolator and Circulator.
 - Give the drawbacks of klystron amplifiers.
 - What is backward wave oscillator (BWO)? State the applications of BWO.
 - State the conditions for an IMPATT diode to produce oscillations.
 - What is the effect of transit time?
 - Define VSWR.
 - What do you mean by slotted line?

SECTION B

2. Attempt any *three* of the following: 10 x 3 = 30
- What is a microwave cavity resonator? Explain it with suitable diagram and equivalent circuit. Where does it find applications?
 - What are S-parameters? Why are they used at microwave frequencies to describe multipoint network? Show that the scattering matrix of four port circular using magic tees is

$$[S] = \begin{bmatrix} 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$$

- Explain in detail about 2-cavity klystron amplifier.
- Describe the operating principle and characteristics of Microwave Tunnel Diode and explain two of its applications.
- What are the various methods for measuring frequency? Discuss them in detail.

SECTION C

- 3. Attempt any one parts of the following:** **10 x 1 = 10**
- a. Write down the advantages, disadvantages and application of a circular waveguide. A circular waveguide in a dominant mode at a frequency of 9 GHz has an initial diameter of 5 cm. Calculate guide wavelength and cutoff wavelength.
 - b. Derive the field distribution of TE_{10} mode in rectangular waveguide and draw its field pattern. Show that TE_{01} and TM_{10} modes do not exist in rectangular waveguide.
- 4. Attempt any one parts of the following:** **10 x 1 = 10**
- a) Explain the construction and working of directional coupler. Derive expression for coupling factor and directivity. Compare single hole and double hole directional coupler.
 - b) (i) Explain the working and applications of circulator. Are they reciprocal or Non reciprocal device?
(ii) What is Faraday rotation? How it is used in designing microwave components?
- 5. Attempt any one parts of the following:** **10 x 1 = 10**
- a) Draw the schematic diagram of TWT amplifier and describe its principle of operation. Give the propagation characteristics of different waves generated in the amplifier
 - b) What are the limitations of conventional active devices at microwave frequency? Explain.
- 6. Attempt any one parts of the following:** **10 x 1 = 10**
- a) Explain IMPATT and TRAPATT diodes in detail and compare their performance.
 - b) Explain:
 - (i) Microwave bipolar junction Transistor.
 - (ii) Transferred electron devices.
- 7. Attempt any one parts of the following:** **10 x 1 = 10**
- a) What do you mean by insertion loss and attenuation? Discuss any one method for measurement of attenuation using microwave test bench.
 - b) Explain the working of frequency meter in detail. Discuss how we can measure the unknown Load with the help of microwave test bench.