

(Following Paper ID and Roll No. to be filled in your Answer Books)

PAPER ID :

Roll No.

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B.TECH.

Theory Examination (Semester-VI) 2015-16

MICROWAVE ENGINEERING

Time : 3 Hours

Max. Marks : 100

SECTION-A

1. Attempt all questions.

(2 × 10=20)

- Differentiate dominant and degenerative Mode in waveguide.
- Calculate the lowest resonant frequency of a rectangular resonator of dimension $a=2$ cm, $b=1$ cm, $d=3$ cm.
- Why the low frequency parameters cannot be measured in Microwaves?
- What parameters determine the performance of directional coupler?
- How the limitation of conventional tubes at microwave frequency can be overcome?
- What is strapping in Magnetron?
- Why the S-parameters but not the H, Y and Z parameters are used in microwaves?
- What do you mean by slotted line?
- Define the purpose of slow wave structures used in TWT amplifiers.
- State the conditions for an IMPATT diode to produce oscillations.

SECTION- B

2. Attempt any three questions.

(10 × 5=50)

- How are waveguides different from normal two wire transmission line. Discuss the similarities and dissimilarities. Show that for a TE_{01} mode, a frequency of 6 GHz will pass through the waveguide of dimension $a = 1.5$ cm, $b = 1$ cm if a dielectric with $\epsilon_r = 4$ is inserted into the waveguide.
- Describe the operation of a two hole directional coupler.
A 90 W power source is connected to the input of a directional coupler with $C = 20$ dB, $D = 35$ dB and an insertion loss of 0.5 dB. Find the output powers at the through, coupled and isolated ports. Assume all ports to be matched.
- Explain the concept of negative differential conductivity. Explain the different modes of oscillation of Gunn diode.
- What are various methods for measuring frequency? Discuss them in detail.
- Write a Schematic diagram of reflex klystron. Explain the action of the tube giving importance to Applegate diagram.
- Explain how a tunnel diode can be used as an amplifier and as an oscillator with the necessary circuit diagram
- Explain the operation of a Faraday rotation isolator with the help of neat sketch. List the applications of Ferrite isolator
- Explain the following:
 - Phase Shifters
 - Wave guide discontinuities

Attempt any two questions.

3. Attempt the following

- a) What are slow wave structures? Explain how a helical TWT achieves amplification?
- b) Derive the Hull cut off voltage equation in Cylindrical Magnetron. Explain the frequency pulling and pushing effect.

4. Attempt the following

- a) Explain the operation of microwave transistors giving an emphasis on their performance parameters.
- b) With the help of suitable diagram, Explain the general setup of Microwave test bench.

5. Attempt the following

- a) A Magic-T is terminated at collinear ports 1 and 2 and difference port 4 by impedance of reflection coefficient 0.5, 0.6 and 0.8 respectively. If the 1 W power is fed at the sum port 3, Calculate the power reflected at the port 3 and power transmitted to the other three ports.
- b) What are avalanche transit time devices? Explain the operation, construction and application of the TRAPTT.