**Printed Pages : 2** 

EEC-603/NEC-601

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## **B.TECH.**

## Theory Examination (Semester-VI) 2015-16

## **MICROWAVE ENGINEERING**

Time : 3 Hours.

# Max. Marks: 100

 $(2 \times 10 = 20)$ 

#### **SECTION-A**

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

## **SECTION-B**

#### 2. Attempt any three questions.

- a) How are waveguides different from normal two wire transmission line. Discuss the similarities and dissimilarities. Show that for a TE<sub>01</sub> mode, a frequency of 6 GHz will pass through the waveguide of dimension a = 1.5 cm, b = 1 cm if a dielectric with  $\varepsilon_r = 4$  is inserted into the waveguide.
- b) 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.
- c) Explain the concept of negative differential conductivity. Explain the different modes of oscillation of Gunn diode.
- d) What are various methods for measuring frequency? Discuss them in detail.
- e) Write a Schematic diagram of reflex klystron. Explain the action of the tube giving importance to Applegate diagram.
- f) Explain how a tunnel diode can be used as an amplifier and as an oscillator with the necessary circuit diagram
- g) Explain the operation of a Faraday rotation isolator with the help of neat sketch. List the applications of Ferrite isolator
- h) Explain the following:
  - (i) Phase Shifters
  - (ii) Wave guide discontinuities

#### (40... 5 50)

#### $(10 \times 5 = 50)$

### **SECTION-C**

## 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, Caculate 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.

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