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

PAPER ID :   Roll No. ☐☐☐☐☐☐☐☐☐☐☐

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)**

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.

j) State the conditions for an IMPATT diode to produce oscillations.

SECTION- B

2. Attempt any three questions.   **(10 × 5=50)**

a) 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 = 1cm if a dielectric with ε_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

SECTION- C

Attempt any two questions.   **(15 × 2=30)**

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.