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Paper Id: 131299 Sub Code: REC 601

Roll No.

B TECH
(SEM-VI) THEORY EXAMINATION 2018-19
MICROWAVE ENGINEERING

Time: 3 Hours *Total Marks: 70*

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. **Attempt *all* questions in brief.** 2 x 7 = 14
   a. Differentiate dominant and degenerative mode in waveguide.
   b. Write any two properties of E-plane tee microwave device.
   c. Define cut-off wave number (kc).show that $kc^2 = \omega^2 \mu \varepsilon$ for loss less dielectric.
   d. Define insertion loss?
   e. What are the applications of reflex klystron?
   f. How microwave solid state device is different from low frequency devices.
   g. State the differences between TWT and klystron.

SECTION B

2. **Attempt any *three* of the following:** 7 x 3 = 21
   a. Explain the working principle of IMPATT diode. How does the electric field and hole concentrations varies with the input ac signal.
   b. What is electron transfer mechanism? Explain the operation and working of Gunn diode.
   c. What is directional coupler? What are the different types of directional coupler? Explain the working principle of 2-hole directional coupler. Also determine its S-matrix
   d. Explain the construction, working and application of microwave isolators.
   e. What do you mean by E-plane tee and H-plane tee? Compare their propagation characteristics.

SECTION C

3. **Attempt any *one* part of the following:** 7 x 1 = 7
   (a) A TE_{11} mode is propagating through a circular waveguide. The guide is air filled and has a diameter of 12 cm. Calculate: (Given $X'_{11}=1.841$) (i) Cut off frequency (ii) Guide wavelength for the frequency of 2.5GHz (iii) Wave impedance at 2.5 GHz frequency.
   (b) Why is Magnetron called cross field device? What is meant by π mode operation in Magnetron containing eight cavity resonators? Describe how strapping separates the π mode from other possible modes.

4. **Attempt any *one* part of the following:** 7 x 1 = 7
   (a) Explain Gunn Effect with respect to two valley model. Draw the graph between applied electric field and current density across Gunn diode.
   (b) A rectangular cavity resonator has dimension a=7.5cm, b=4cm and c=16 cm. calculate cut- off wave number and phase constant.

5. **Attempt any *one* part of the following:** 7 x 1 = 7
   (a) Classify different types of microwave amplifiers and oscillators. Discuss Working principle of avalanche transit time devices.
   (b) What is circulator? Discuss its theory of operation and suggest its applications.

6. **Attempt any *one* part of the following:** 7 x 1 = 7
   (a) With the help of functional diagram, explain the working principle of two cavity Klystron amplifier. Calculate optimum length of drift space, maximum efficiency, and voltage gain.
   (b) What are the various methods for measuring frequency? Discuss them in details.

7. **Attempt any *one* part of the following:** 7 x 1 = 7
   (a) Show that the TM_{01} and TM_{10} modes in rectangular waveguide do not exist.
   (b) Discuss method to measure impedance of load. Indicate the use of smith chart in this measurement.