

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 $kc^2 = \omega^2 \mu \epsilon$ 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 $a=7.5\text{cm}$, $b=4\text{cm}$ and $c=16\text{cm}$. 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.