PAPER ID-410417

Subject Code: KEC074

Roll No: | | | | | | | | | | | | | |

B. TECH.
(SEM VII) THEORY EXAMINATION 2021-22
MICROWAVE & RADAR ENGINEERING

Time: 3 Hours ***Total Marks: 100***

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

SECTION A

1. Attempt *all* questions in brief. 2 x 10 = 20

(a) Differentiate dominant and degenerative mode in waveguide.
(b) Define cut-off wave number (k_c). Show that $k_c^2 = \omega^2\mu\varepsilon$ for lossless dielectric.
(c) Give the difference between Isolator and Circulator.
(d) What is Hybrid ring in microwave?
(e) In a helical slow wave structure if pitch is 5 cm and diameter is 10 cm, calculate the axial velocity with which wave will propagate**.**
(f) What is the condition for sustained oscillation in Reflex Klystron?
(g) Explain Mode jumping in Magnetron?
(h) What do you mean by slotted line?
(i) What is radar clutter?
(j) Define maximum unambiguous range of radar.

SECTION B

2. Attempt any *three* of the following: 10 x 3 = 30

(a) Explain the limitations of conventional active devices at microwave frequency?
(b) What is directional coupler? Explain the working principle of 2-hole directional coupler and determine its S-matrix.
(c) What is a Microstrip line? How does its characteristic impedance change with change in width to height ratio? Give a reason for using lower dielectric constant substrate in place of alumina at higher microwave frequencies.
(d) What is meant by insertion loss and attenuation? Discuss any one method for measurement of attenuation using microwave test bench.
(e) Derive the radar range equation.

SECTION C

3. Attempt any *one* part of the following: 10 x 1 = 10

(a) Derive the field distribution of TE_{10} mode in rectangular waveguide. Show that TE_{01} and TM_{10} modes do not exist in rectangular waveguide
(b) What is a microwave cavity resonator? Explain it with suitable diagram and equivalent circuit. Where does it find applications?

4. Attempt any *one* part of the following: 10 x 1 = 10

(a) Why S parameters are used at microwave frequencies to describe multiport network? Draw the schematic diagram of four port microwave circulator and derive its S matrix.
(b) Explain the operation of a Faraday rotation isolator with the help of neat sketch. List the applications of ferrite isolator.

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5. Attempt any *one* part of the following: 10 x 1 = 10

(a) With support of figures, explain the working of TWT. Also write its limitations.

(b) Explain the working principle of two cavity Klystron amplifier. Calculate optimum length of drift space.

6. Attempt any *one* part of the following: 10 x 1 = 10

(a) Discuss the salient features of microwave measurements. Describe a voltage standing wave ratio (VSWR) meter.

(b) What are various methods for measuring frequency? Discuss in detail.

7. Attempt any *one* part of the following: 10 x 1 = 10

(a) Derive expression for probability of false alarm in radar.

(b) Draw Block diagram and explain the operation of MTI radar.