

Roll No.

Total No. of Pages : 02

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**B.Tech .(ECE) (Sem.-6)**  
**MICROWAVE AND RADAR ENGINEERING**

Subject Code : BTEC-601

M.Code : 71121

Date of Examination : 17-05-2023

Time : 3 Hrs.

Max. Marks : 60

**INSTRUCTIONS TO CANDIDATES :**

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

**SECTION-A**

**1. Answer briefly :**

- a. Why transferred electron devices able to operate at higher frequency than BJT?
- b. What is a directional coupler?
- c. Explain tunnelling effect.
- d. List applications of TRAPATT diode.
- e. Explain the modes of Gunn diode.
- f. What is gyrator?
- g. What is meant by radar range?
- h. Define Doppler shift in pulsed radar.
- i. List the two advantages of CW radar.
- j. Define standing wave ratio.

### SECTION-B

2. Derive power output and efficiency of a reflex klystron.
3. Derive an expression for velocity modulation in two cavity Klystron with the help of a neat diagram.
4. Explain the different methods used for measuring microwave frequency.
5. Explain with block diagram the working of MTI Radar with power amplifier and power oscillator.
6. Derive Radar range equation.

### SECTION-C

7. Derive the expression for axial electric field in the TWT.
8. Explain with neat diagram, the working of CW radar with non-zero IF.
9. A reflex klystron operates under the following conditions:  $V_0 = 600V$ ,  $R_{sh} = 15 K\Omega$ ,  $f_r = 9 \text{ GHz}$ ,  $L = 1 \text{ mm}$ ,  $e/m = 1.759 \times 10^{11}$ . The tube is oscillating at  $f_r$  at the peak of the  $n = 2$  or  $1\frac{3}{4}$  mode. Assume that the transit time through the gap and beam loading to be neglected. Determine, the value of the repeller voltage, the direct current necessary to give a microwave gap voltage of 200 V, and the electronic efficiency under this condition

**NOTE : Disclosure of identity by writing mobile number or making passing request on any page of Answer sheet will lead to UMC against the Student.**