

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VII (OLD) EXAMINATION – SUMMER 2019****Subject Code: 171001****Date: 21/05/2019****Subject Name: Microwave Engineering****Time: 02:30 PM TO 05:00 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1 (a)** Discuss advantages of microwave frequencies over lower frequencies; also explain some areas of microwave application. **07**
- (b)** Define the following terms **07**
- i) TEM wave, ii) TE wave, iii) TM wave, iv) HE wave, v) Characteristic Impedance, vi) Reflection coefficient, vii) Input impedance.
- Q.2 (a)** Explain the working principle of 'Magic Tee' in detail with S-matrix and neat diagram. **07**
- (b)** Determine the cut-off wavelength for the dominant mode in a rectangular waveguide of breadth 10 cm. For a 2.5 GHz signal propagated in this waveguide in the dominant mode; Calculate the guide wavelength, the group and the phase velocities. **07**
- OR**
- (b)** A two cavity Klystron amplifier has the following parameters. **07**
Beam voltage: $V_0 = 900$ V, Beam current: $I_0 = 30$ mA, Frequency: $f = 8$ GHz,
Gap spacing in either cavity: $d = 1$ mm, Spacing between centers of cavities: $L = 4$ cm, Effective shunt impedance: $R_{sh} = 40$ k Ω . Determine,
i) The electron velocity, ii) The d.c. electron transit time, iii) The input voltage for maximum output voltage, iv) The voltage gain in decibels.
- Q.3 (a)** Explain functioning of four ports circulator with neat schematic diagram. **07**
- (b)** Describe working principle of Helix Travelling Wave Tube with neat diagram. **07**
- OR**
- Q.3 (a)** Explain operational principle, V-I characteristics, construction, advantages and disadvantages of IMPATT diode with neat diagram. **07**
- (b)** Describe all the characteristics of Smith chart. **07**
- Q.4 (a)** Write a short note on Varactor diodes. **07**
- (b)** Derive three expressions for maximum radar range, R_{max} . **07**
- OR**
- Q.4 (a)** Draw and explain block diagram of 'Pulsed Radar System'. **07**
- (b)** Prove that reflection coefficient (ρ) is dependent on characteristic impedance (Z_0) and load impedance (Z_L), also specify how their different values affects ρ . **07**
- Q.5 (a)** Explain function of cylindrical magnetron with neat diagram. **07**
- (b)** Describe MTI Radar functions with neat block diagram. **07**
- OR**
- Q.5 (a)** Explain various radar display methods with neat diagram. **07**
- (b)** Derive an expression for characteristics impedance and quality factor of microwave strip lines. **07**
