

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- VIIth SEMESTER-EXAMINATION – MAY/JUNE- 2012****Subject code: 171001****Date: 24/05/2012****Subject Name: Microwave Engineering****Time: 02:30 pm – 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) What are microwaves? Explain advantages of microwave and its applications. **07**
 (b) Derive necessary equations for attenuation constant and phase constant with reference to EM wave propagating along transmission line. **07**

- Q.2** (a) Sketch circular and rectangular waveguide and compare their dominant mode, advantages and disadvantages. **07**
 (b) The dimension of a waveguide is 2.5X1cms. The frequency is 8.6GHz. Find the possible modes that can propagate through the waveguide also find the cutoff frequencies for the same. **07**

OR

- (b) A rectangular waveguide is filled by dielectric material of $\epsilon_r = 9$, with inside dimension of 7X3.5cm. It operates in the dominant TE_{10} mode. Determine (i) cut off frequency (ii) phase velocity at a frequency of 2 GHz (iii) guided wavelength at the same frequency. **07**

- Q.3** (a) Draw and explain waveguide bend, corners and twist in detail with their applications. **07**
 (b) What is the purpose of directional Coupler. Define coupling factor, directivity, isolation of Directional coupler and write expression for each. **07**

OR

- Q.3** (a) A typical transmission line has a resistance of $6\Omega/\text{km}$, inductance of $2.2\text{mH}/\text{km}$, a capacitance of $0.005\mu\text{F}/\text{km}$ and a conductance of $0.05\mu\text{mho}/\text{km}$. Calculate the characteristic impedance, attenuation constant and phase constant of the transmission line at a frequency of 1kHz. Also calculate the phase velocity of the signal. **07**
 (b) Explain the operation of Magic TEE with its s-parameter. Also list some applications of magic TEE. **07**

- Q.4** (a) Explain the mechanism of oscillations of Magnetron Oscillator with the aid of suitable diagram and discuss its performance characteristics. **07**
 (b) Explain the amplification process for a helix type travelling wave tube. What are its different applications? **07**

OR

- Q.4** (a) Describe the construction and working of a reflex klystron. Explain how velocity and current modulation takes place using the Applegate diagram. **07**
 (b) Explain the Tunnel diode characteristics with the aid of Energy band diagram. **07**

- Q.5** (a) Derive the radar range equation. Calculate the maximum range of a radar system which operates with a wavelength at 3 cm with a peak pulse power of 600KW if effective aperture of antenna A_e is 5 m^2 , minimum detectable signal is 10^{-13} W and the radar cross sectional area of the target is 20 m^2 . **07**
 (b) Explain Gunn effect using two valley theory. **07**

OR

- Q.5** (a) What is a pulsed radar? Explain the pulsed radar with its block diagram. **07**
 (b) Explain IMPATT Diode with its construction, working and application. **07**
