Seat No.: _____ *Enrolment No._____*

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 ε_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 band, 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 6Ω /km, inductance of 2.2mH/km, a capacitance of 0.005 μF/km and a conductance of 0.05μmho/km. Calculate the characteristic impedance, attenuation constant and phase constant of the transmission line at a frequency of 1kHz.Alo 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**

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