Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII • EXAMINATION – SUMMER • 2015

Subject Code: 171001 **Date: 01/05/2015**

Subject Name: Microwave Engineering

Time:02.30pm-05.00pm **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)** Define Following: **07**
Microwave, Transmission coefficient, Pure travelling wave, Pure Standing wave, Blind speed, Phase Velocity, Velocity modulation

(b) 1) Discuss in brief the advantages of microwave. **03**

2) A transmission line has a characteristic impedance of 75+j0.01Ω and is terminated in a load impedance of 70+j50Ω. Calculate the reflection coefficient and Transmission coefficient. Also verify the relationship $T^2 = Z_l/Z_0(1-\Gamma^2)$. Where T= Transmission coefficient and Γ=Reflection coefficient. **04**

Q.2 **(a)** Define Standing wave and derive equation of the voltage standing wave. Also find equations for the minimum and maximum amplitude and distance between any two successive maxima or minima. Draw the standing wave pattern for lossy and lossless line. **07**

(b) State the characteristics of smith chart. A lossless transmission line has characteristic impedance 50Ω is terminated in a load impedance 50+j50Ω the operating wavelength λ=4cm. Find out 1st V_{max} and V_{min} from load using smith chart also find VSWR. **07**

OR

(b) Which are the merits of double stub impedance matching compare to single stub. A single stub tuner is to match a lossless line of 400Ω to a load of 800-j300 Ω. The characteristic impedance of stub is 400 Ω. The frequency is 3 GHz. Find the distance in meters from the load to the tuning stub. Determine the length in meters of the short circuited stub. Find two possible solutions. **07**

Q.3 **(a)** Explain in detail E-plane Tee. With S-matrix prove that the Tee junction cannot be matched to all the three arms simultaneously. **07**

(b) Describe properties of S-parameters. Explain working of two-hole directional coupler and derive it's S-Matrix. **07**

OR

Q.3 **(a)** How are waveguides different from normal two-wire transmission line? Discuss similarities and dissimilarities. Show that TEM wave cannot propagate in a waveguide by making use of Maxwell's equations. **07**

(b) Explain the terms cutoff wavelength and dominant mode. Determine the cutoff wavelength for the dominant mode in a rectangular waveguide of breadth 10 cms. For a 2.5 GHz signal propagated in this waveguide in the dominant mode; calculate the guide wavelength, the group and phase velocities? **07**

Q.4 **(a)** What is velocity modulation? Explain with diagram how velocity modulation is utilized in Klystron amplifier? **07**

(b) Explain GUNN effect. Describe the construction of GUNN diode and mention performance, characteristics and applications. **07**

OR

Q.4	**(a)**	Explain favorable and unfavorable electrons with respect to Magnetron. Explain the performance of magnetron and list important applications.	**07**
	(b)	What are avalanche transit time devices? Explain the operation, construction and application of the IMPATT diode.	**07**
Q.5	**(a)**	Derive the radar range equation. Enlist the factor affecting the range of radar. A marine radar operating at 10GHz has a maximum range of 50km with an antenna gain of 4000. If the transmitter has a power of 250KW and minimum detectable signal of 10^{-11} W. Determine the cross-section of the target the radar can sight.	**07**
	(b)	Explain the principle of MTI radar with block diagram.	**07**

OR

Q.5	**(a)**	What is microstrip line? Derive equation of characteristic impedance and quality factor of microstrip line.	**07**
	(b)	Explain different display methods of RADAR.	**07**

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