Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

B. E. - SEMESTER – VII • EXAMINATION – WINTER 2012

Subject code: 171001 **Date: 26/12/2012**

Subject Name: Microwave Engineering

Time: 10.30 am - 01.00 pm **Total Marks: 70**

Instructions:

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

Q.1	**(a)**	A1). Define following terms: 1. Standing wave ratio and 2. Return loss.	**02**
		A2). A lossless transmission line with characteristic impedance of 300 ohm is fed by a generator with impedance 100 ohm. The line is 100 m long and is terminated by a resistive load of 200 ohm. Calculate the load reflection coefficient, VSWR, the transmission loss and the return loss.	**05**
	(b)	Draw equivalent circuit of transmission line and derive basic equations for voltage and current on transmission line. Define characteristic impedance of transmission line.	**07**
Q.2	**(a)**	What is the importance impedance matching? Give your answer w.r.t. transmission line. Derive expression of the length of short-circuit stub for impedance matching on transmission line.	**07**
	(b)	A 100 ohm line with air as dielectric is terminated by a load impedance of 75 + j40 ohm and is excited at 1 GHz by a matched generator. Find the position of a single stub of 100 ohm impedance on the line, and determine the length of the stub. Solve using Smith chart.	**07**
		OR	
	(b)	A lossless 50 ohm air line has V_{max} = 2.5 V and V_{min} = 1 V when terminated with an unknown load. The distance between the successive voltage minima is 5 cm and the first voltage minimum from the load end is 1.25 cm. Design a short circuited single stub for impedance matching. Solve using Smith chart.	**07**
Q.3	**(a)**	Why does the TEM mode can not propagate through hollow rectangular waveguide? Derive wave equation/s for rectangular waveguide.	**07**
	(b)	Explain with diagram the pattern of field lines observed in strip lines and microstrip lies.	**07**
		OR	
Q.3	**(a)**	Define following terms with respect to waveguide: 1. Phase velocity and 2. Group velocity. Derive expression for both of them.	**07**
	(b)	Enumerate merits and demerits of microstrip line compared to other types transmission media at microwave frequencies. Explain briefly parallel strip lines.	**07**
Q.4	**(a)**	Draw diagram of E-plane Tee junction and derive s-parameter matrix for the same.	**07**
	(b)	Draw cavity magnetron and explain its working with clear diagrams for π-mode and phase focusing effect.	**07**
		OR	
Q.4	**(a)**	Derive s-parameter matrix for the E-H-plane Tee under the condition that all four ports are matched. Draw necessary diagrams.	**07**
	(b)	Using applegate diagram explain working of reflex klystron. Differentiate between klystron and travelling wave tube.	**07**
Q.5	**(a)**	Explain Doppler effect and continuous wave Doppler radar along with necessary diagrams.	**07**
	(b)	What do you understand by avalanche transit time effect? Explain working, construction, and applications of TRAPATT device.	**07**
		OR	
Q.5	**(a)**	What are the factors which limits the sensitivity of a radar receiver? Derive the range equation considering the noise figure of the radar receiver.	**07**
	(b)	Explain working of tunnel diode and give its applications.	**07**

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