Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE-Semester VII Examination Nov/Dec-2011

Subject code: 171001 Date: 19/11/2011

Subject Name: Microwave Engineering

Time: 10.30 am-1.00 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)**	(i) "Vessels in microwave oven should be of dielectric material." Justify with proof. (ii) Explain impossibility of TEM wave propagation through the waveguide.	**07**
	(b)	(i) What is magic associate with magic tee junction? (ii) What do you mean by apple gate diagram? Explain bunching in two cavity klystron.	**07**
Q.2	**(a)**	Explain in brief standing wave and reflection coefficient of transmission line and derive the expression for the impedance and reflection coefficient at any point on the line.	**07**
	(b)	A rectangular waveguide has dimension of 2.29 cm and 1.02 cm. It is desired that this waveguide is to be operated only in dominant mode and operating frequency is at least 25% above cut off frequency of dominant mode and not higher than 95% of the next cut off frequency. What is allowable operating frequency?	**07**
		OR	
	(b)	What do you mean by reciprocal network? Draw and explain series tee junction and find its simplified S-matrix using S-parameter.	**07**
Q.3	**(a)**	What is micro strip line? Derive expression of characteristics impedance of micro strip line using comparative or alternative method.	**07**
	(b)	Draw schematic of four port circulator and explain its working, also show and explain how one can construct a four port circulator using two magic tees and a phase shifter.	**07**
		OR	
Q.3	**(a)**	A 5.2 cm length of lossless 200 Ω line is terminated in a load impedance of 60 + j100 Ω. **Using smith chart** (i) Determine $\lvert\tau_L\rvert$, φ_L and SWR along the line. (ii) Determine the Z and Y at the input and at a point 2.0 cm from the load end. The signal frequency is 750 MHz and $\lambda = \lambda_0$.	**07**

	(b)	Give difference between two cavity klystron and reflex klystron. Also draw the schematic of reflex klystron and explain its working.	**07**
Q.4	**(a)**	Draw different slow wave structures and write why slow wave structures are used in traveling wave tubes? Also explain working of TWT with neat sketch.	**07**
	(b)	Give at least three differences between microwave transistor and TEDs (i.e. transfer electron devices). Write the statement of Gunn effect and explain GaAs diode.	**07**
		OR	
Q.4	**(a)**	What do you mean by favorable electrons? Draw cross-sectional view of cavity magnetron and discus field inside the interaction gap.	**07**
	(b)	(i) Explain figure of merit of various surface geometries of microwave bipolar transistor. (ii) Describe the applications of the parametric amplifier.	**07**
Q.5	**(a)**	Derive expression for range of the radar. Practically how one can increase the range of radar?	**07**
	(b)	(i) Explain microwave characteristic of Tunnel diode. (ii) Discuss quality factor for a varactor diode.	**07**
		OR	
Q.5	**(a)**	What is Doppler effect? With block diagram explain Doppler radar.	**07**
	(b)	An X-band pulsed cylindrical magnetron has the following operating parameters: Anode voltage V_0 = 26KV, beam current I_0 = 27A, magnetic flux density = 0.336 tesla, radius of cathode cylinder a = 5 cm, radius of vane edge to center b = 10 cm. Find (i) The cyclotron angular frequency, (ii) The cut off voltage for fixed B_0, (iii) The cut off magnetic flux density for fixed V_0.	**07**

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