

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. **07**
 Derive expression of the length of short-circuit stub for impedance matching on transmission line.
- (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? **07**
 Derive wave equation/s for rectangular waveguide.
- (b)** Explain with diagram the pattern of field lines observed in strip lines and microstrip lines. **07**
- OR**
- Q.3 (a)** Define following terms with respect to waveguide: 1. Phase velocity and 2. Group velocity. **07**
 Derive expression for both of them.
- (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**
