

**EC-7001 (CBGS)****B.E. VII Semester**

Examination, November 2018

**Choice Based Grading System (CBGS)****Microwave Engineering***Time : Three Hours**Maximum Marks : 70*

- Note:** i) Attempt any five questions out of eight questions.  
 ii) All questions carry equal marks.  
 iii) Assume suitable data, if required.

1. a) List out various applications of Microwave and briefly explain any two of them.  
 b) An open wire transmission line has the following primary constants  $R = 4\Omega/\text{km}$ ,  $L = 2.5 \text{ mH/km}$ ,  $C = 0.009 \mu\text{F/km}$ ,  $G = 0.29 \mu\text{mho/km}$  and frequency of operation is  $1 \text{ kHz}$ . Determine the following parameters  
 i)  $Z_0$  ii)  $\alpha$   
 iii)  $\beta$  and iv) Phase velocity
2. a) A rectangular waveguide with dimension of  $3 \times 2 \text{ cms}$  operates in  $\text{TM}_{11}$  mode at  $10 \text{ GHz}$ . Determine the characteristic wave impedance.  
 b) Draw the structure and explain the velocity modulation process in two cavity klystron amplifier.
3. a) For the dominant mode of operation in an air filled circular waveguide of inner diameter  $4 \text{ cms}$ . Find:  
 i) Cut off wavelength <https://www.rgpvonline.com>  
 ii) Guided wave length  
 iii) Cut off frequency

- b) Discuss the dominant and higher order modes in strip line structure. <https://www.rgpvonline.com>
4. a) List different types of Magnetron. Explain mechanism of oscillations of Magnetron oscillator with diagram.  
 b) An air-filled circular waveguide has a radius of  $2 \text{ cm}$  and is to carry energy at a frequency of  $10 \text{ GHz}$ . Find all the  $\text{TE}_{np}$  and  $\text{TM}_{np}$  modes for which energy transmission is possible.
5. a) Explain the coupling factor and directivity of the four ports directional coupler. Also derive the S-matrix for completely matched four-port directional coupler.  
 b) Mentioned the symbol and schematic diagram of microwave circulator. Explain the working of the same using geometry containing two magic tee and one phase shifter along with its simplified s-matrix.
6. a) Mentioned the basic principal of IMPATT and TRAPATT diodes.  
 b) What is standing wave? Derive the equation of Voltage Standing Wave Ratio (VSWR) in terms of reflection coefficient.
7. a) Discuss the reasons due to which the measurement of Z, Y, h and ABCD parameter are difficult at microwave frequencies. Elaborate the S-parameters for the multi-port network along with any two properties.  
 b) The S-parameters of a two-port network are given by  $S_{11} = 0.2 \angle 0^\circ$ ,  $S_{22} = 0.1 \angle 0^\circ$ ,  $S_{12} = 0.6 \angle 90^\circ$ ,  $S_{21} = 0.6 \angle 90^\circ$  <https://www.rgpvonline.com>  
 i) Prove that the network is reciprocal but not lossless.  
 ii) Find the return loss at port 1 when port 2 is short-circuited.
8. Write short note (any four):  
 a) MASER b) Tuned Detectors  
 c) BARITT d) Microwave resonators  
 e) TWT Amplifier

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