

(Pages : 3)

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Reg. No. : .....

Name : .....

**Eighth Semester B.Tech. Degree Examination, November 2019**

**13.805.6 : MICROWAVE DEVICES AND CIRCUITS (T)**

**(Elective – V)**

**(2013 Scheme)**

Time : 3 Hours

Max. Marks : 100

PART – A

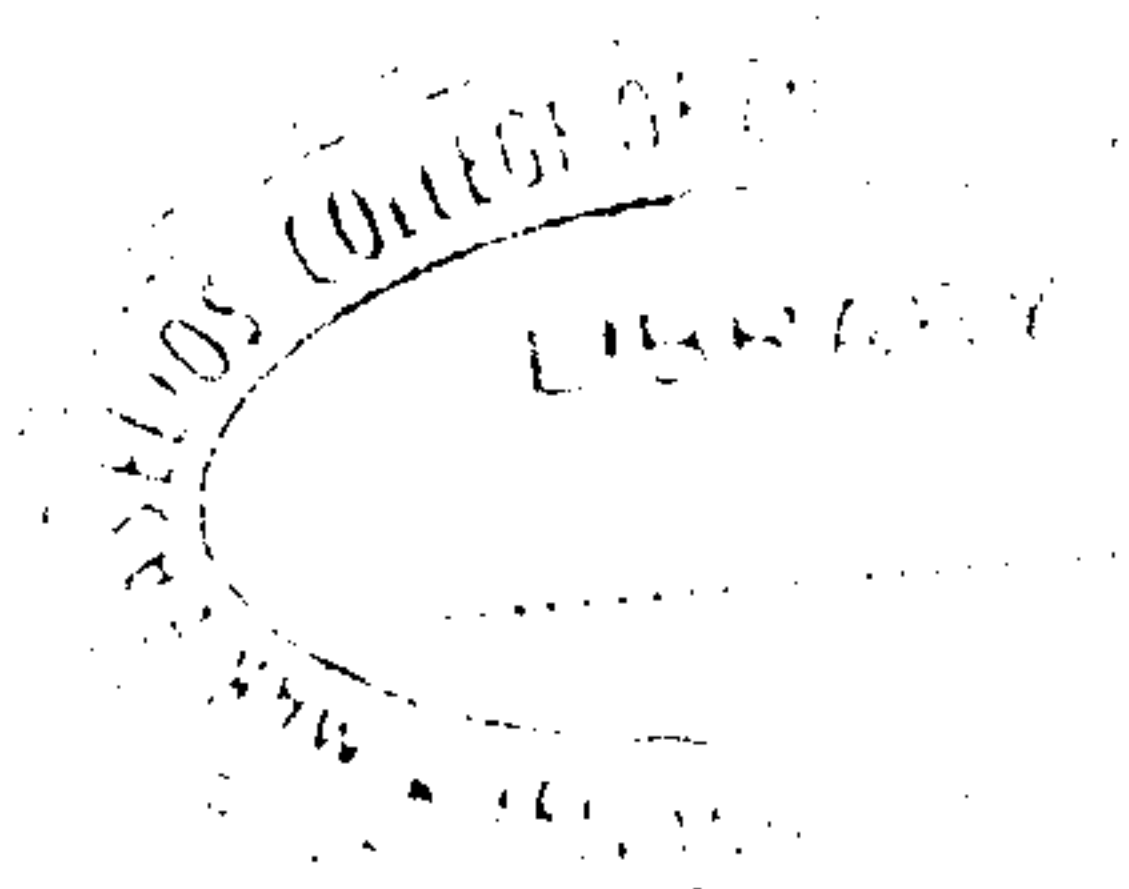
*(Answer **all** questions. Each carries **2** marks)*

1. Discuss about “dominant mode” and “degenerated mode” in rectangular waveguides.
2. Define Q-Factor of a Cavity Resonator.
3. Compare strip line and microstrip lines.
4. Explain the concept of S-matrix with respect to a 2-port network.
5. Draw a two dimensional figure of H-plane Tee junction and explain its properties.
6. Explain single stub matching technique with diagram.
7. Compare conventional p-n junction diode and GUNN diode.
8. What is an IMPATT diode. Give its application.
9. Explain two types of emission with respect to MASERS.
10. Explain a parametric amplifier with diagram.

**(10 × 2 = 20 Marks)**

P.T.O.





## PART – B

(Answer **any one** full question from each module, each carries **20** marks)

### Module – I

11. (a) Derive equations of field components for  $TE_{mn}$  mode propagation in a rectangular waveguide **10**
- (b) An air filled rectangular wave guide of inside dimensions  $7\text{cm} \times 3.5\text{cm}$  operates in the dominant mode ( $TE_{10}$ ). Find the cutoff frequency ( $f_c$ ) and phase velocity of the wave in the guide at  $3.5\text{GHz}$ . **10**
12. (a) Draw the structure of micro-strip line and explain its working. Write the equation for its characteristic impedance ( $Z_0$ ) and explain important terms. **10**
- (b) What is a cavity resonator? Draw a rectangular cavity resonator and write the equation for its resonant frequency. **10**

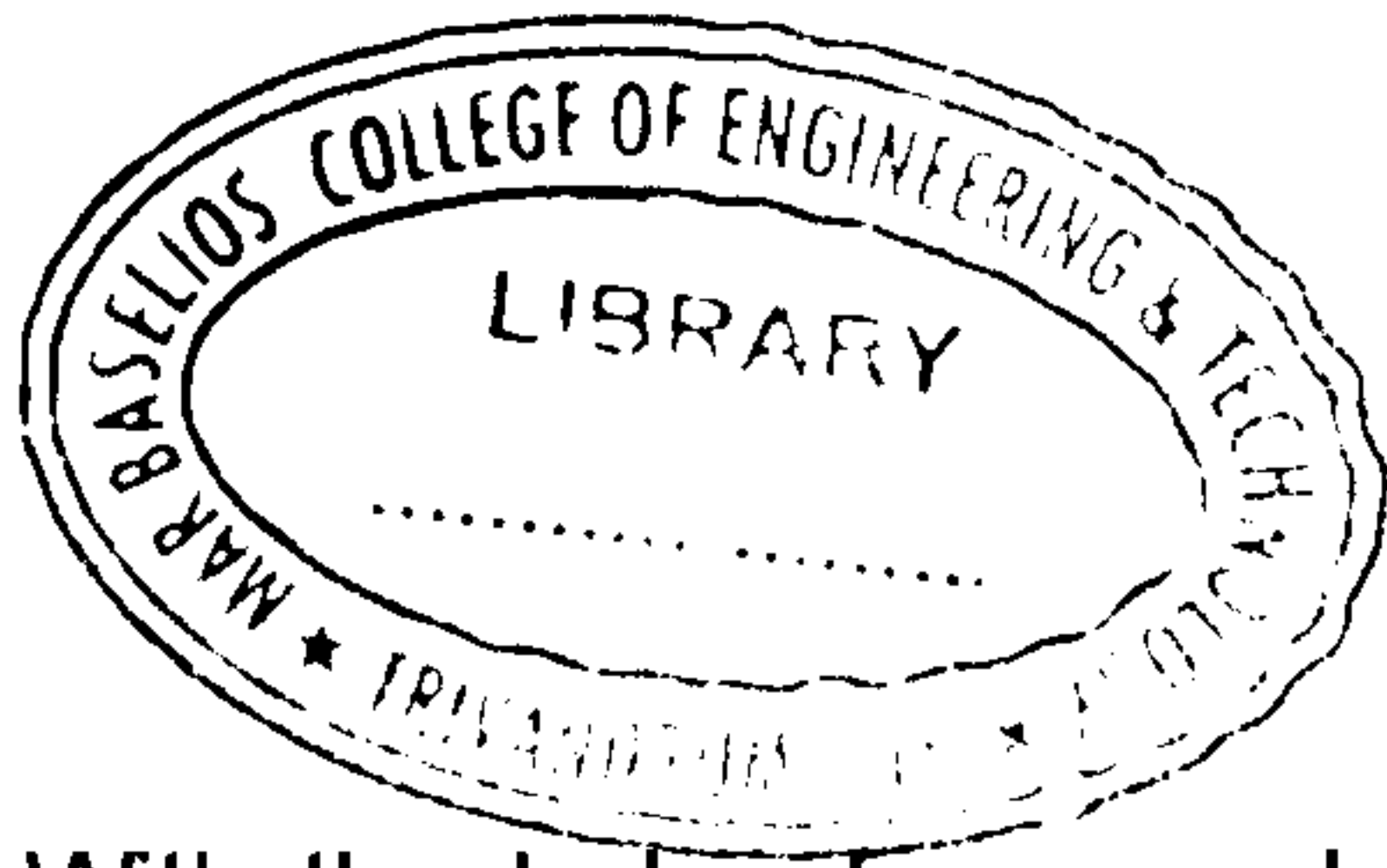
### Module – II

13. (a) Draw a Magic Tee and explain its properties. **8**
- (b) Obtain the S-matrix of magic Tee **4**
- (c) Explain circulator used in microwave. **8**
14. (a) Draw and explain a 2-hole directional coupler and obtain its S-matrix. **8**
- (b) Explain important properties of S-matrix. **4**
- (c) With diagrams, explain double stub impedance- matching technique. **8**

### Module – III

15. (a) Explain a GUNN diode with structure. **8**
- (b) Explain two valley theory of negative resistance property. **6**
- (c) What are HEMTs? Draw its physical structure and explain its operation. **6**





16. (a) With the help of energy band diagrams ,Explain the operation of a tunnel diode. **10**
- (b) Draw the structure of IMPATT diode and explain its working. **10**

#### **Module – IV**

17. (a) Explain a parametric up convertor and down convertor with relevant diagrams and equations. **10**
- (b) Discuss about the Power Gain, Noise figure and bandwidth of a Negative-resistance parametric amplifier. **10**
18. (a) Explain the constructional features and working of Ruby Maser **10**
- (b) Derive Manley-Rowe power relations for an ideal nonlinear reactance. **10**
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