**Q. Code:450487**

**Reg. No.** | | | | | | | | | | | | | | |

# B.E / B.TECH. DEGREE EXAMINATIONS, MAY 2024

Seventh Semester

## EC18701 – RF AND MICROWAVE ENGINEERING

*(Electronics and Communication Engineering)*

**(Regulation 2018 / Regulation 2018A)**

**TIME: 3 HOURS** **MAX. MARKS: 100**

| COURSE OUTCOMES | STATEMENT | RBT LEVEL |
|---|---|---|
| **CO 1** | Explain the active and passive components at microwave frequencies. | **2** |
| **CO 2** | Analyze the multi-port networks and transistor amplifiers at RF frequencies. | **4** |
| **CO 3** | Analyze microwave devices for various applications. | **4** |
| **CO 4** | Evaluate the microwave sources and their applications. | **3** |
| **CO 5** | Measure and analyze the microwave signal parameters. | **3** |

### PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

| | | CO | RBT LEVEL |
|---|---|---|---|
| **1.** | List any four reasons for the wide use of RF. | **1** | **2** |
| **2.** | What is the significance of ABCD parameters? | **1** | **2** |
| **3.** | Define transducer power gain. | **2** | **2** |
| **4.** | Mention the amplifier parameters in terms of performance specifications. | **2** | **2** |
| **5.** | Draw the diagram of H-plane Tee junction. | **3** | **2** |
| **6.** | The power incident on the 20 dB directional coupler with directivity of 40 dB and the power at the input port is 900 mW, calculate the coupled power and transmitted power. | **3** | **3** |
| **7.** | Distinguish between klystron and TWT? | **4** | **2** |
| **8.** | How the bunching is achieved in a cavity magnetron? | **4** | **2** |
| **9.** | What is Bolometer? Give two examples? | **5** | **2** |
| **10.** | Compare Spectrum and Network Analyzer. | **5** | **2** |

### PART- B (5 x 14 = 70 Marks)

| | | Marks | CO | RBT LEVEL |
|---|---|---|---|---|
| **11. (a)** | Explain the properties of scattering matrix with proof. | **(14)** | **1** | **3** |
| | **(OR)** | | | |
| **(b)** | Formulate scattering matrix for the n-port microwave network. | **(14)** | **1** | **3** |

| | | | | | |
|---|---|---|---|---|---|
| **12. (a)** | A microwave amplifier is characterized by its S-parameters. Derive the equations for power gain, available power gain and transducer power gain for a transistor amplifier. | **(14)** | **2** | **3** |
| | **(OR)** | | | |
| **(b)** | With the help of stability circles, obtain the condition for unconditional and conditional stability of an RF amplifier. | **(14)** | **2** | **3** |
| **13. (a)** | Derive the scattering matrix for the Hybrid Tee using 'S' parameter theory. | **(14)** | **3** | **3** |
| | **(OR)** | | | |
| **(b)** | Describe the Gunn Effect with the aid of two valley model theory. | **(14)** | **3** | **3** |
| **14. (a)** | Derive the equation of velocity modulated wave and discuss the concept of bunching effect in two cavity klystron. | **(14)** | **4** | **3** |
| | **(OR)** | | | |
| **(b)** | Draw the cross sectional view of Magnetron tube and explain how bunching occurs in it. Derive the expression for Hull cut off voltage. | **(14)** | **4** | **3** |
| **15. (a)** | Demonstrate the principle of microwave power measurements. | **(14)** | **5** | **3** |
| | **(OR)** | | | |
| **(b)** | Elaborate the impedance and dielectric constant measurement using necessary block diagrams. | **(14)** | **5** | **3** |

## PART- C (1 x 10 = 10 Marks)

(Q.No.16 is compulsory)

| | | Marks | CO | RBT LEVEL |
|---|---|---|---|---|
| **16.** | The S-Parameters of a two-port network are given as $[S]=\begin{bmatrix} 0.1\angle 90^\circ & 0.6\angle 90^\circ \\ 0.6\angle 0^\circ & 0.1\angle 90^\circ \end{bmatrix}$<br>(a) Determine whether the network is lossy or not?<br>(b) Is the network symmetrical and reciprocal?<br>(c) Find the input return loss, insertion loss, transmission loss, input reflection loss, and output reflection loss, when its ports are perfectly matched? | **(10)** | **1** | **5** |

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