

Code No: **R1632042**

R16

SET - 1

III B. Tech II Semester Regular/Supplementary Examinations, August-2021

MICROWAVE ENGINEERING

(Electronics and Communication Engineering)

Time: 3 hours

Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)

2. Answer **ALL** the question in **Part-A**

3. Answer any **FOUR** Questions from **Part-B**

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**PART -A**

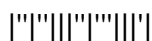
**(14 Marks)**

1. a) What is a dominant mode? [2M]
- b) Sketch circular and rectangular wave guide. [2M]
- c) What is bunching process? [2M]
- d) What is meant by strapping? [3M]
- e) What do you mean by S parameter? Why it is be used for analysis of Microwave networks? [3M]
- f) What is transferred electron effect? [2M]

**PART -B**

**(56 Marks)**

2. a) Deduce the electromagnetic field relations for the dominant mode in a rectangular waveguide from the Maxwell's equations. [7M]
- b) A rectangular wave guide with dimension of 4 cm  $\times$  3 cm operates in the TM<sub>11</sub> mode at 10 GHz. Determine the characteristic wave impedance. [7M]
3. a) Write the advantages and disadvantages of rectangular waveguide over circular wave guide. List out the differences between the TE mode and TM mode. [7M]
- b) An air-filled circular waveguide has a radius of 2 cm and is to carry energy at a frequency of 10 GHz. Find all the TEnp and TMnp modes for which energy transmission is possible. [7M]
4. a) Explain the working of multi cavity klystron with necessary diagram and waveforms. [7M]
- b) What is velocity modulation? Explain with a diagram how velocity modulation is utilized in Klystron amplifier? [7M]
5. a) A TWT operates with following parameters:  $V_b = 2.5$  KV;  $I_b = 25$  mA;  $Z_0 = 10$ ; circuit length,  $L = 50$ ;  $f = 9$  GHz. Find the gain parameter and power gain. [7M]
- b) Explain favorable and unfavorable electrons with respect to Magnetron. Explain the performance of magnetron and list important applications. [7M]



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6. 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. [7M]
- b) Describe the structure of Waveguide irises, Tuning Screws and Posts with diagrams. [7M]
7. a) What are avalanche transit time devices? Explain the operation, construction and application of the IMPATT diode. [7M]
- b) How to measure low power microwave energy? Explain. [7M]

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