

III B. Tech II Semester Supplementary Examinations, November/December - 2016

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. Answering the question in **Part-A** is compulsory

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

PART -A

- 1 a) Derive the expression for cut-off frequency of a rectangular wave guide. [4M]
- b) What are the design considerations for a micro strip line? [3M]
- c) Explain scattering parameters in microwave components. [4M]
- d) Explain the bunching process in reflex klystron. [4M]
- e) Explain any two applications of magnetron. [3M]
- f) Explain RWH theory. [4M]

PART -B

- 2 a) Derive the wave equation for a TE wave and obtain all the field components in a rectangular waveguides. [8M]
- b) A hollow rectangular waveguide has dimensions $a=1.5$ cm, calculate the amount of attenuation if the frequency of the signal is 6GHz. [8M]
- 3 a) A rectangular-cavity resonator has dimensions of $a=5$ cm, $b=2$ cm and $d=15$ cm, compute. i)the resonant frequency of the dominant mode for an air-filled cavity. [10M]
ii)the resonant frequency of the dominant mode for a dielectric-filled cavity of $\epsilon_r=2.56$
- b) Define a reentrant cavity and give at least two examples. Where are these used? [6M]
- 4 a) Explain briefly about circulators and isolators. [8M]
- b) Find the Hybrid ring S-parameters and explain with neat sketch. [8M]
- 5 a) A two-cavity amplifier klystron has the following parameters beam voltage $V_o=900$ V, [10M]
beam current $I_o=30$ mA, frequency $f=8$ GHz, gap spacing in either cavity $d=1$ mm, spacing between centers of cavities $L=4$ cm, effective shunt impedance $R_{sh}=40$ K , determine
i)The electron velocity ii)The dc electron transit time iii)The input voltage for maximum output voltage iv)The voltage gain in decibels.
- b) Derive the output power of Two-cavity klystron amplifier. [6M]
- 6 a) Explain the modes of resonance and PI mode operation. [8M]
- b) Explain 8-cavity cylindrical travelling wave. [8M]
- 7 a) Draw and explain in detail about IMPATT diode. [8M]
- b) Draw a neat diagram of a microwave bench setup and explain in detail about all the components. [8M]

