

B.Tech III Year II Semester (R09) Supplementary Examinations May/June 2016

MICROWAVE ENGINEERING

(Electronics and Communication Engineering)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

- 1 Derive the expressions for the field components due to TE waves in rectangular waveguide.
- 2 An air filled resonant cavity with dimensions $a = 5$ cm, $b = 4$ cm and $c = 10$ cm is made of copper ($\sigma_c = 5.8 \times 10^7$ mhos/m). It is filled with a lossless material ($\epsilon_r = 3$). Find the resonant frequency f_r and the quality factor for TE_{101} mode.
- 3 Draw the H-plane Tee diagram, equivalent circuit and field diagram and explain how power is coupled into port 3.
- 4 Show that the scattering matrix for shunt T-junction matched at arm 3 is given by:
$$[s] = \frac{1}{2} \begin{bmatrix} -1 & 1 & \sqrt{2} \\ 1 & -1 & \sqrt{2} \\ \sqrt{2} & \sqrt{2} & 0 \end{bmatrix}$$
- 5 (a) Discuss about the classification of linear beam tubes (O-type).
(b) A reflex klystron operates at the peak mode of $n = 2$ with beam voltage $V_0 = 300$ V. Beam current $I_0 = 20$ mA, signal voltage $V_1 = 40$ V. Determine: (i) Input power in watts. (ii) Output power in watts. (iii) Efficiency.
- 6 (a) Explain how the oscillations are sustained in cavity magnetron with suitable sketches assuming that the π -mode oscillations already exist.
(b) Explain how the same effect is obtained without strapping.
- 7 (a) Explain the principle of operation of IMPATT diode. Mention its performance characteristics.
(b) List advantages of using Gunn diodes over IMPATT diodes.
- 8 (a) Draw the basic spectrum analyzer block diagram and explain how it works.
(b) Compare the methods of impedance measurement using slotted line and reflectometer.
