

Code No: 57036

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech IV Year I Semester Examinations, May/June - 2015

MICROWAVE ENGINEERING

(Electronics and Communication Engineering)

Time: 3 Hours

Max. Marks: 75

Answer any Five Questions
All Questions Carry Equal Marks

- 1.a) What are dominant and degenerate modes? What is the significance of dominant modes? Indicate the dominant mode in rectangular wave guide and calculate f_c for the same.
- b) Design a rectangular waveguide so that the cut off frequency for the TE_{10} mode is 14GHz and the cut off frequency for TM_{11} mode is 3GHz. [8+7]
- 2.a) What is meant by cavity resonator? Derive the expression for the resonant frequency of the rectangular cavity resonator.
- b) A microstrip line is made of a copper conductor has 0.362mm width on a G-10 fiber glass-epoxy board which is 0.30mm in height. The relative dielectric constant ϵ_r of the board material measured at 30GHz is 5.2. The microstrip-line of 0.028mm thickness is used for 15GHz. Assume the conductivity of copper is 5.96×10^7 mho/cm. Determine the parameters given below:
- Characteristic impedance Z_0 of the microstrip line
 - Surface resistivity R_s of the copper conductor
 - Conductor attenuation constant α_c
 - Quality factor Q_c
- [8+7]
- 3.a) Explain the working of a two hole directional coupler with a neat diagram and derive the expression for the coupling and directivity of a two-hole directional coupler.
- b) Explain the working of a dielectric phase shifter with neat diagram. [8+7]
- 4.a) Explain Faraday rotation with neat diagram and explain the working of a ferrite isolator.
- b) Obtain the scattering matrix for a 3-port circulator and also prove that it is impossible to construct a perfectly matched lossless, reciprocal 3-port junction. [8+7]
- 5.a) What are the limitations of conventional tubes at microwave frequencies. Explain how these limitations can be overcome.
- b) A reflex klystron having an accelerated field of 300V oscillates at a frequency of 10GHz with a retarding field of 500V. If its cavity is returned to 9GHz, what should be the new value of the retarding field for oscillations in the same mode to take place? [8+7]