Code No: 57036 **R09**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech IV Year I Semester Examinations, February /March- 2016

MICROWAVE ENGINEERING

(Electronics and Communication Engineering)

Time: 3 Hours **Max. Marks: 75**

Answer any Five Questions

All Questions Carry Equal Marks

1.a) Enumerate the basic Advantage, Disadvantages and Applications of Microwave Engineering.

b) Derive the TE_{mn} mode field equation in a rectangular waveguide. [7+8]

2.a) Derive the expression $f_0 = \frac{c}{2}\left[\left(\frac{m}{a}\right)^2 + \left(\frac{n}{b}\right)^2 + \left(\frac{p}{d}\right)^2\right]^{\frac{1}{2}}$

b) A rectangular waveguide has dimensions 2.5 × 5 cms. Determine the guide wavelength, phase constant and phase velocity at a wavelength of 4.5 cms for dominate mode.

c) Derive the quality factor of cavity resonator. [5+5+5]

3.a) Explain any TWO methods of Directional Coupler.

b) Explain different types of microwave T-junctions. [7+8]

4.a) Explain the action of isolator, gyrator and circulator using ferrites. Mention their typical applications. Draw suitable diagrams.

b) Determine the [S] matrix of a 3-port circulator given insertion loss of 0.5 dB, isolation of 20 dB and VSWR of 2. [7+8]

5.a) What are the limitations of conventional tubes at microwave frequencies? Explain how these limitations can be overcome?

b) A Two cavity klystron amplifier has the following specifications.
Vo=900 V, Io= 30 mA, f=8 Ghz, d= 1 mm, L=4 cm, R_{sh}=49 GΩ.
Determine (i) The electron velocity, (ii) The dc transit time of electron, (iii) The input voltage for maximum output voltage,(iv) The Voltage gain in decibels. [7+8]

6.a) Explain the construction and working principle of 8 cavity cylindrical magnetron . Derive Hulls Cutoff voltage Equation.

b) The helical TWT has diameter of 5mm with 50 turns per cm. Calculate axial phase velocity and anode Voltage at which the TWT can be operated for useful gain. [7+8]

7.a) Explain different modes of Transferred Electronic Devices(TEDs).

b) What is meant by Avalanche Transit Time Devices? Explain the operation, construction and Applications of Trapped Plasma Avalanche Triggered Transit Devices. [7+8]

8.a) Draw the Schematic block diagram of Typical microwave bench and Explain the functionality of each component.

b) Explain the LOW microwave power measurement technique. [8+7]

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