Code No: 127FE **R15**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech IV Year I Semester Examinations, December-2023/January-2024

MICROWAVE ENGINEERING

(Electronics and Communication Engineering)

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

Note: i) Question paper consists of Part A, Part B.

ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.

iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A

(25 Marks)

1.a) Sketch field lines for rectangular waveguide in TM_{11} mode. [2]

b) A microstrip line has a substrate 2mm thick and with a dielectric constant $e_r = 4$. The strip width W=2mm. Find the characteristic impedance? [3]

c) For the electronically controlled attenuator, the return loss is 10dB. Calculate the input VSWR. [2]

d) Draw the E-plane tee and identify the isolated ports. [3]

e) What is apple-gate diagram? [2]

f) What are the limitations of conventional tubes at microwave frequencies? [3]

g) Why IMPATT diodes are not used for local oscillator of microwave receivers? [2]

h) How to separate a pi-mode in Magnetron? [3]

i) What are the different methods to measure microwave frequency? [2]

j) Why z parameters are not measured at microwave frequencies? [3]

PART – B

(50 Marks)

2.a) Find the cutoff frequency for the TE_{10} mode in a rectangular waveguide with dimensions 4 cm by 2 cm. And also find the guide wavelength and phase velocity at a frequency 25 percent higher than the cutoff frequency?

b) Derive the equation for cutoff frequency of rectangular waveguide in TE mode. [4+6]

OR

3.a) How to model the fringing effects of Microstrip?

b) Draw and explain the impedance characteristics of waveguide in both TE and TM modes. [5+5]

4.a) What are the different types of terminations used for waveguides? Explain them.

b) Draw the basic construction of rotary attenuator and explain its working. [5+5]

OR

5.a) Explain the working of Bethe-hole directional coupler with neat diagram.

b) What is gyrator and how it gives the 180 degrees phase shift? [5+5]

6.a) How O-type tubes are classified?

b) Explain how velocity modulation is converted into current modulation in two-cavity klystron amplifier? [5+5]

OR

7. Explain the electron bunching process in Reflex klystron with neat diagram and derive the equation for it power efficiency. [10]

8. Derive the equation for Hull-cut-off voltage in 8 cavity magnetron and explain its working with neat diagram. [10]

OR

9.a) Explain how LSA mode of Gunn oscillator produce several watts of power?

b) What are the advantages of Transit time devices? [5+5]

10.a) What are the various precautions that has to be take care while measuring microwave parameters.

b) Explain how to measure the attenuation of micro waves with neat block diagram? [5+5]

OR

11. Derive the S-matrix of Magic tee and prove all the properties of S-parameters. [10]

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