Code No: 137EK **R16**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech IV Year I Semester Examinations, December - 2019

MICROWAVE ENGINEERING

(Electronics and Communication Engineering)

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

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A

(25 Marks)

1.a) What are the applications of Microwaves? [2]
b) Define the phase and group velocities. [3]
c) What is post? What are the applications? [2]
d) Compare probe and loop connectors. [3]
e) What are the limitations of conventional tubes at microwave frequencies? [2]
f) What are the advantages of slow wave structures? [3]
g) How to separate a π mode in Magnetron? [2]
h) What are the applications of Gunn diode? [3]
i) Why Isolator is used in microwave measurements? [2]
j) Why Z and Y parameters are not measured at microwave frequencies? [3]

PART – B

(50 Marks)

2. Starting from Maxwell's equations, derive the field equations of rectangular waveguides in TM mode. [10]

OR

3.a) Why TEM wave propagation is not possible in rectangular wave guide
b) Show that at frequencies much higher than the cut-off frequency, the Q of a rectangular guide carrying the dominant TE10 wave approaches the value $Q \rightarrow b\alpha_m$ Where $\alpha_m = \sqrt{w\mu_m \sigma_{m/2}}$ is the attenuation factor for a wave propagating in the metal of the guide walls? [6+4]

4.a) What are the different types of waveguide attenuators? Explain their working with neat diagrams.
b) Draw the structure of Magic Tee and write its characteristics. [5+5]

OR

5.a) Draw the structure of Ferrite isolator and explain its working.
b) Explain how Gyrator gives phase shift and explain it with neat diagram. [5+5]

6. How the oscillations are generated in reflex klystron and explain bunching process with apple gate diagram and also derive the equation for efficiency. [10]

OR

7. What are the different modes of operation of TWT and explain them. [10]

8. How cross-field is used to generate oscillations in Magnetron and derive the Hull cut-off condition? [10]

OR

9. What is mean by transferred electron devices? Explain its principle of operation and draw its characteristics. [10]

10.a) Derive the S matrix of directional coupler and define all the parameters.
b) State and derive the unitary property of S matrix. [6+4]

OR

11. How to find Low and high VSWR of a given load at microwave frequencies? Explain. [10]

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