R16

Code No: 137EK

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech IV Year I Semester Examinations, July/August - 2023
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)	Define Wavelength and Impedance.	[2]
b)	What is group velocity and phase velocity.	[3]
c)	Define Q-factor and coupling coefficient.	[2]
d)	Discuss about coupling mechanism.	[3]
e)	What are the gain consideration in TWT Tube?	[2]
f)	Define output power and efficiency in klystron amplifier.	[3]
g)	What is meant by PI-mode?	[2]
h)	Define avalanche transits time device.	[3]
i)	Write the applications of Magic tee.	[2]
j)	Define standing wave measurements.	[3]

PART – B
(50 Marks)

2.a) Determine the MW spectrum and its bands in detail.
b) Draw cross section fields of TE and TM modes and explain. [5+5]

OR

3.a) Discuss about TE and TM mode Characteristics.
b) Determine the wavelength, impedance and power transmissions of TEM mode. [6+4]

4.a) What is multiport junction. Explain about H-plane tee.
b) Define waveguide phase shifter. Explain types of phase shifters and explain each. [5+5]

OR

5.a) Explain about directional coupler with neat diagram.
b) Explain about Gyrator, Isolator and Circulator. [4+6]

6. Calculate velocity modulation and electron bunching in two cavity klystron amplifier and Derive the efficiency of Two-cavity Klystron amplifier. [10]

OR

7.a) Draw and explain about Reflex klystron amplifier.
b) Calculate the output power gain of the Travelling Wave Tube (TWT) is operated at a frequency f= 10GHz If the circuit length N_l= 50 and characteristic impedance of helix Z_0 = 10Ω with voltage V_0 = 3kv and beam current I_0= 30mA. [5+5]

8.a) Explain Two-valley theory (RWH Theory) of Gunn diode.

b) Calculate the phase velocity of a linear magnetron has the following operating parameters: magnetic flux density $\beta = 0.016 wb/m^2$, thickness h = 2 cm and distance between anode and cathode d = 4 cm. anode voltage V_0= 4kv, cathode current I_0= 1.5A operating frequency f = 6 GHz. [5+5]

OR

9.a) Write the different types of Magnetrons and Explain about cavity cylindrical magnetron with neat diagram.

b) Explain about PI- mode operation and separation, and write its characteristics. [6+4]

10.a) Draw and explain about Magic Tee and calculate its S- parameters.

b) Explain the measurement of Attenuation using Microwave bench set-up. [5+5]

OR

11.a) Explain the measurement of Impedance using slotted line.

b) Explain the measurement of Microwave power by using Bolometer method. [5+5]

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