

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
SEVENTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019

Course Code: EC461

Course Name: MICROWAVE DEVICES AND CIRCUITS

Max. Marks: 100

Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks.

Marks

- 1 a) What are the limitations of conventional solid state devices at microwaves ? (5)
- b) What does IMPATT diode stands for and with neat diagram explain the construction and working of it and derive power and efficiency of the same. ? (10)
- 2 a) Explain GaAs MESFET with structure and principle of operation? Why GaAs MESFETs are preferred over Si MESFETs ? (10)
- b) Discuss different biasing techniques used for microwave bipolar transistor ? (5)
- 3 a) Explain one port negative resistance oscillator ? (5)
- b) A typical n-type GaAs GUNN diode has the following parameters (10)
 - Threshold field E_{th} = 2800 V/cm
 - Applied field E = 3200 V/cm
 - Device length L = 10 μ m
 - Doping concentration n_o = $2 \times 10^{14}/\text{cm}^3$
 - Operating frequency = 10 GHz
 - a) Compute the electron drift velocity
 - b) Current density
 - c) Negative electron mobility

PART B

Answer any two full questions, each carries 15 marks.

- 4 a) Find the ABCD matrix coefficient computation of a transmission line section with characteristic impedance ' Z_o ' propagation constant ' β ' and length ' l ' ? (7)
- b) Discuss the working of quarter wave transformer and halfwave (8)
- 5 a) Explain the working of single stub tuning ? (6)
- b) Discuss in detail about impedance and frequency scaling (9)
- 6 a) List the Kuroda's identity. (5)

- b) Design a low pass filter for fabrication using microstrip line. The specifications are cut-off frequency of 4 GHz, third order, impedance of $50\ \Omega$ and a 3 dB equi-ripple characteristics. The normalized low pass proto-type values are $g_1 = 3.3487 = L_1$, $g_3 = 3.3487 = L_3$, $g_2 = 0.7117 = C_2$, $g_4 = 1.000 = R_L$. (10)

PART C

Answer any two full questions, each carries 20 marks.

- 7 a) Compare Monolithic MICs with hybrid MICs (7)
 b) Explain stripline in detail. (8)
 c) The stripline designed with a dielectric material with $b = h = 3.1\text{ mm}$, $w = 2.5\text{ mm}$ (5)
 Find characteristic impedance Z_0 ? $\sqrt{\epsilon_r} = \sqrt{10.5}$.
 8 a) Discuss different configurations of capacitors in MICs. (10)
 b) Compare short circuit and open circuit resonator. (5)
 c) Discuss discontinuities in MICs. (5)
 9 a) Explain the classifications of switches. (7)
 b) Write notes on 1) Attenuators 2) Slotlines (7)
 c) Classify the losses in Microstrip lines (6)
