PVP 17

Code: **17ECMC1T4**

I M.Tech - I Semester – Regular / Supplementary Examinations
December 2018

SOLID STATE MICROWAVE DEVICES
(MICROWAVE & COMMUNICATION ENGINEERING)

Duration: 3 hours Max. Marks: 60

Answer the following questions.

1.a) Explain the physical structure and configurations of Hetero-junction Transistors with suitable diagrams. 8 M

b) A certain silicon MW transistor has reactance $X_c = 1\Omega$, transit-time cutoff frequency $f_r = 4$GHz, Max. electric field $E_m = 1.6 \times 10^5$ V/cm and saturation drift velocity $\nu_s = 5 \times 10^5$ m/s. Determine the Max. allowable power that the transistor can carry. 7 M

(OR)

2.a) Explain the MW characteristics of Tunnel Diode and draw its V-I characteristics. 8 M

b) Discuss about power frequency limitations of silicon bipolar transistor. 7 M

3.a) Explain the physical structure and principle of operation of MESFET. 8 M

b) A HEMT Gate width W= 150 μm, electron velocity $\nu_{(z)} = 2 \times 10^{5}$ m/s and two-dimensional electron-gas density $n(z) = 5.21 \times 10^{15}\ m^{-2}$. Determine the drain current of HEMT. 7 M

(OR)

4.a) Explain about physical structure and performance characteristics of MOSFET. 8 M

b) Draw the equivalent circuit of HEMT and its Electronic applications. 7 M

5.a) What is Gunn Effect? Explain about GaAs Diodes. 8 M

b) In n- type GaAs Gunn Diode has electron drift velocity $\nu_d = 2.5 \times 10^{5}$ m/s, negative electron mobility $\mu_n = 0.015 m^2/v$, and relative dielectric constant $€_r = 130$. Determine the criterion for classifying the modes of operation. 7 M

(OR)

6.a) An LSA oscillator has conversion efficiency η= 0.06, multiplication factor M= 3.5, threshold field E_{th}= 320kV/m, device length L= 121 μm, donor concentration n_o= 10^{21} m^3, average carrier velocity ν_o = 1.5 x10^{5} m/s and area A= 3 x 10^{-8} m^2. Determine the output power. 8 M

b) Distinguish between LSA diodes and InP diodes. 7 M

7.a) Explain about the principle and operation of TRAPATT diode and discuss about power output and efficiency. 8 M

b) Draw and explain about three different doping profiles of an IMPATT diode. 7 M

(OR)

8.a) A TRAPATT diode has doping concentration N_A= 2 x $10^{15}cm^{-3}$, current density J= 20 kA/cm^2. Calculate the avalanche- zone velocity. 7 M

b) Explain about parametric up-converter and down converter in parametric amplifier and write its applications. ? 8 M