Code: **17ECMC1T4**

PVP 17

I M.Tech-I Semester-Regular Examinations-February 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 Microwave Transistors with suitable diagrams. 8 M

b) A Ge-GaAs heterojunction transistor has Lattice constant a_1= 5.646A, Electron affinity X_1= 4eV, energy gap E_{g1}= 0.8eV in Ge and Lattice constant a_2= 5.653A, Electron affinity X_2= 4.07eV, energy gap E_{g2}= 1.43eV in GaAs. Find the conduction-band differential and the valence-band differential between Ge and GaAs. 7 M

(OR)

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

b) Discuss about amplification phenomena of Bipolar Transistor. 7 M

3.a) Explain the physical structure and principle of operation of Junction Field Effect Transistor. 8 M

b) A certain Si JFET has channel height a= 0.1μm, electron concentration N_d= 8 x 10^{17} cm^{-3} and relative dielectric constant $€_r$= 11.8. Calculate the pinch-off voltage V_p. 7 M

(OR)

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

b) Discuss the Drain current and Transconductance of MOSFET. 7 M

5.a) Explain about differential Negative resistance and Two-valley model Theory in RWH Theory. 8 M

b) In n- type GaAs Gunn Diode electron density n= 10^{18} cm^{-3}, electron density at lower valley n_l= 10^{10} cm^{-3}, electron density at upper valley n_u= 10^8 cm^{-3}, and temperature T= 300^0K. Determine the conductivity of the diode. 7 M

(OR)

6.a) Distinguish between LSA diodes and InP diodes. 7 M

b) An LSA oscillator has conversion efficiency η= 0.06, multiplication factor M=3.5, threshold field E_{th}= 320kV/m, device length L= 121μm, 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

7.a) Explain about the principle and operation of READ diode and discuss its avalanche multiplication. 8 M

b) Derive and discuss Negative resistance, Power output and Efficiency of IMPATT diode. 7 M

(OR)

8.a) An M-Si-M BARITT diode has the dielectric constant $€_r$=11.8, donor concentration N=2.8 x 10^{21} m^{-3} and silicon length L= 6 μm. Determine the breakdown voltage and the breakdown electric field. 7 M

b) In Parametric Devices how can you understand Non linear reactance and Manley - Rower power relations? 8 M