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UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, May 2018

Program: B.Tech (Electronics Engg) **Semester – VI**
Subject (Course): Microwave Engg **Max. Marks : 100**
Course Code : ELEG415 **Duration : 3 Hrs**
No. of page/s:02

Attempt ALL Questions

Section –A **(4x5 =20 marks)**

Q1. Design third order lumped element maximally flat response Low pass filter at fc =2.4 GHz.

Given g1=1=g3 and g2 =2. Assume port impedance is 75 ohms. (CO4)

Q2. Explain the working of Magic TEE along with S-Parameters. (CO2)

Q3. Rectangular cavity resonator with dimensions(a=2.4 cm, b=1.2cm, d=5 cm) is operating at 6 GHz. Find the cut-off frequency , guided wavelength and wave impedance of the dominant mode. (CO1)

Q4. Explain the working of TRAPATT Diode with the help of V-I Characteristics.(CO3)

Section –B **(4x10 =40)**

Q5. Derive the expression for attenuation factor of TM modes in rectangular waveguide. (CO1)

Q6. Design Branch line coupler and realize using microstrip on FR4 dielectric substrate operating at 2.4 GHz. (CO2)

Q7. Derive the expression for efficiency of reflex klystron. (CO3)

Q8..A normal Cylindrical magnetron has the following parameters: (CO3)

Inner radius =0.15m outer radius =0.45m, Magnetic flux density =1.2 milliweber/sq.m

Find the Hull Cutoff Voltage and cutoff magnetic flux density if the beam voltage is 6000 Volts.

Section –C **(2x20 =40)**

Q9a).Two cavity klystron amplifier has the following parameters:

Beam Voltage =900 Volts, beam current = 30 mA, Frequency =8 GHz,

Gap spacing in either cavity =1mm, spacing between the center of cavities =4 cm

Effective Shunt impedance =40 KΩ. Find the electron Velocity, dc electron transit time, Input voltage for maximum output voltage, output voltage and Voltage gain in decibels. (CO3)

b) A symmetric directional coupler has the following characteristics: (CO2)

Directivity =infinity, forward attenuation =20 dB

SWR at p1 =2 and p2 is matched and p3 is connected with unknown load impedance.

Pout at p1 =9 mW and at p2 =3mW. Find SWR in P3 and power delivered to load impedance.

Q10a). A typical n-type GaAs Gunn diode has the following parameters: (CO4)

Threshold field =2.8KV/cm, Applied field =3.2KV/cm

Device length =10μm, operating frequency =10 GHz, Doping concentration =$2x10^{14}/cm^3$

Find the electron drift velocity , current density, negative electron mobility.

b). Rectangular waveguide operating at 10 GHz and said to possess cutoff wavelength of 4.5 cm used in measuring High SWR of 13 and 3 dB point variations observed to be 0.001. Find guided propagation constant and unknown load impedance. (CO5)

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Section –A **(4x5 =20 marks)**

Q1.Design 5th order maximally flat response LPF operating at 6 GHz with stopband attenuation of 25 dB and having Cut-off frequency 5.2GHz. Lowest and highest impedance of the lines are 20 and 120 ohms respectively. Port impedance is 50 ohms. Given g1 =0.6916 =g5, g3=2, g2 =g4 =1.6981. (CO4)

Q2.Why TMm0 or TM0n modes are not supported by rectangular waveguide. (CO1)

Q3. Explain the formation of high field domain in READ diode. (CO4)

Q4. Explain the working of Harmonic Frequency Converter. (CO5)

Section –B **(4x10 =40)**

Q5. Derive the transformation equations of Low pass filter into BPF. (CO4)

Q6. Derive Hartree Condition in Linear Magnetron. (CO3)

Q7.Explain the working of Tunnel diode with the help of energy band diagrams.(V<Vp, V=Vp, Vv<V<inf, Vp<V<Vv). (CO4)

Q8. Derive the field expressions for TM modes in Cylindrical waveguide. (CO1)

Section –C **(2x20 =40)**

Q9.An air filled rectangular waveguide has a dimensions of 7x3.5cm and is to carry energy at f=3 GHz. Find all TE and TM modes for which transmission is possible. Find the change in the characteristics of waveguide if it is filled with dielectric material of relative dielectric constant =9.1. (CO1)

Q10a). Design rat-Race coupler operating at 5.2 GHz and realize it using RT-Duriod 5880 substrate. (CO2)

b). An O-type helix TWT operates at 8 GHz. Slow wave structure has the pitch angle of 4.4 deg and an attenuation of 2 Np/m. Determine the four propagation constants. (CO3) -----

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