Register Number.....

M.E. DEGREE EXAMINATIONS: OCTOBER/NOVEMBER-2008

Third Semester

COMMUNICATION SYSTEMS

P07CME01 RF System Design

Time: Three Hours **Maximum Marks: 100**

Answer ALL Questions:-

PART A (20 × 1 = 20 Marks)

1. The field components are orthogonal to each other and both are orthogonal to the direction of propagation in
A TE mode B. TM mode C. TEM mode D. TE&TM

2. The phase velocity V_p of the TEM wave is
A. $1/\sqrt{\varepsilon\mu}$ B. $1/\sqrt{\varepsilon}\ \mu$ C. $1/\varepsilon\mu$ D. μ/ε

3. Compute the intrinsic wave impedance of an electromagnetic wave in free space for the frequency 30 MHz
A. 299 Ω B.377 Ω C.376 Ω D.220 Ω

4. The wavelength range of C band is
A.15 -7.5 cm B.2.4 -1.67 cm C.7.5-3.75 cm D.30-15 cm

5. In RF filters the loss factor can be defined as
A. $1/1-|\Gamma in|^2$ B. $1-|\Gamma in|^2$ C. $1/|\Gamma in|^2$ D. $1/1-|\Gamma in|$

6. The advantage of chebyshev low pass filter compare to cauer low pass filer is
A. power loss in the pass band B. to precisely control the magnitude of the ripple.
C to precisely control the phase value D.ripples maintain the unequal amplitudes

7. In RF filters the ratio of the average stored energy to the energy loss per cycle at the resonant frequency is called as
A. Shape factor B.Ripple C.Insertion Loss D. Quality Factor

8. Group Delay is
A. defined as the frequency derivative of the phase.
B.defined as the frequency derivative of the amplitude.
C.defined as the amplitude derivative of the Phase
D.defined as the amplitude derivative of the frequency

9. In a Si PN Junction the doping concentrations are $N_A=10^{18}$ cm^{-3} and $N_D=5\times10^{15}$ cm^{-3} with an intrinsic concentration of $n_i=1.5\times1010cm-3$.Find the barrier voltage for $T=300^{o}K$.

A. 7.96 V B.1.96 V C.0.796 V D. 0.3 V

10. The Junction Capacitance of a PN Junction is
A. $Cj=Cj_o\ (1-V_A/V_{diff})^{-1/2}$ Where $Cj_o=A\ [q\varepsilon N_A N_D/2\ V_{diff}N_A+N_D]^{1/2}$
B. $Cj= [1-V_A/V_{diff}]^2$
C. $Cj=1/\ Cj_o\ (1-V_A/V_{diff})^{-1/2}$ Where $Cj_o=A\ [q\varepsilon N_A N_D/2\ V_{diff}N_A+N_D]^{1/2}$
D. $Cj= A\ [q\varepsilon N_A N_D/2\ V_{diff}N_A+N_D]^{1/2}$

11. Which of the following will not be suitable for applications of Schottky diode
A.Amplifiers B.RF Detectors C.Mixers D. RF Filters

12. Which Transistor exploits the difference in band gap energy between dissimilar Semiconductor materials such as GaAl As, GaAs and etc.
A.MESFET B. MOSFET C.MODFET D.JFET

13. Which of the following network completely transforming all lumped components to distributed elements network
A.T and PI Matching Networks
B.T Matching Networks
C.Microstrip Line Matching Networks
D.Single –Stub Matching Networks

14. In any device is noise free, the noise figure would be
A. 0 B. 1 C.∞ D.100

15. The main advantages of balanced Amplifiers are
A. reduction in frequency response
B. circuit complexity
C. it can use 3 dB Coupler
D. very good impedence matching at the input and output port

16. Intermodulation distortion (IMD) occurs due to
A. applying two unmodulated harmonic signals of slightly different amplitude to the input of an amplifier
B. applying two unmodulated harmonic signals of slightly different frequencies to the input of an amplifier
C.because of the linear behavior of the device.
D.due to the probability of error.

17. Which Oscillator has a larger effective inductive reactance
A. Colpitts Oscillators B.Hartley Oscillators C. Clapp Oscillators
D.Tunnel Diode Oscillators

18. The conversion loss of a mixer is defined in dB as
A. $10\log (P_{IF}/P_{RF})$ B. $10\log (P_{RF}/P_{IF})$ C. $10\log (P_{IF}.\ P_{RF})$ D. $\log (P_{IF}/P_{RF})$

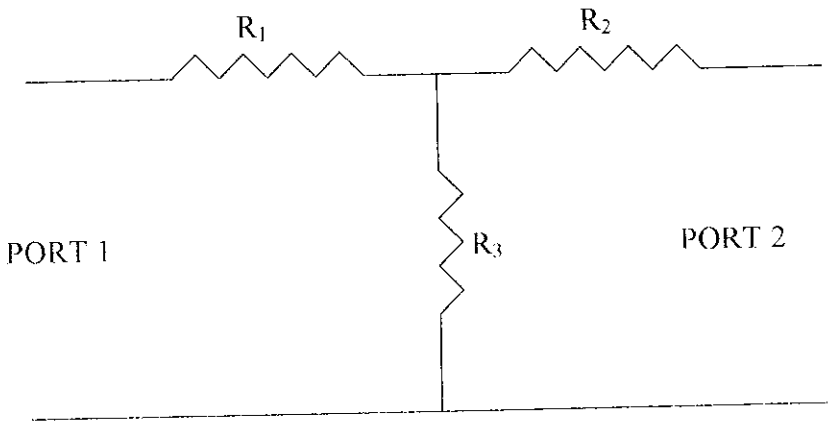
19. Gunn Element employed to create Oscillators
A. from 1 to 100 MHz for 1W output power
B. from 1 to 100 Hz for 1W output power
C. from 1 to 100 THz for 1W output power
D. from 1 to 100 GHz for 1W output power

20. A ferromagnetic material whose permeability can be externally controlled by a Ho (Stable Magnetic Field)
A.Yittrium Iron Garnet B. Erbium Iron Garnet C. Iron Garnet
D.Galium Iron Garnet

PART B (5 × 16 = 80 Marks)

21.(a)(i).Explain in detail about various types of High frequency Resistors. (8)

(ii).Find the S parameters and the resistive elements for the 3dB attenuator network is shown in fig.



Assuming that the network is placed into a transmission line section with a characteristic line impedence of Zo=50Ω. (8)

(OR)

(b).Discuss in detail any 3 most common passive chip elements and their electrical Characteristics. (16)

22. (a). (i) Compare Butterworth filters and Chebyshev filters. (8)

(ii) Briefly explain about Odd and Even Mode Excitation of Coupled Filter. (8)

(OR)

(b).Explain Microstrip Filter Design with Examples. (16)

23. (a). (i) Draw and explain the cross sectional view & equivalent circuit model of Si Schottky diode. (8)

(ii) With neat diagram explain the current-voltage behavior of the tunnel diode and how it works as amplifier. (8)

(OR)

(b). Discuss briefly about Large and Small Signal FET Models. (16)

24. (a).An RF amplifier has the following S-Parameters: S_{11}=0.3 ∠-70 °, S_{21}=3.5 ∠-85 ° S_{12}=0.2 ∠-10 °, S_{22}=0.4 ∠-45 °. Furthermore the input side of the Amplifier is connected to a voltage source with Vs=5V ∠0 ° and source impedence Zs=40Ω. The output is utilized to drive an antenna which has an impedence of Z_L= 73 Ω.Assuming that the S-parameters of the amplifier are measured with reference to a Z_o=50 Ω characteristic impedence. Find the following quantities:

(i) Transducer gain G_T, unilateral transducer gain G_{TU}, available gain G_A, Operating Power Gain G (8)

(ii) Power delivered to the load P_L, available power P_A and incident power to the amplifier P_{inc}. (8)

(OR)

(b|).Explain in detail about High Power and Multistage Amplifier. (16)

25. (a). (i) Write a short note on Dielectric Resonator Oscillator. (8)

(ii)Draw and analyze the design of varactor diode oscillator. (8)

(OR)

(b). (i) Explain the basic mixer concept and characteristics . (8)

(ii) Explain in detail about single balanced MESFET mixer with coupler and power Combiner. (8)

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