Roll No. | |

B.E / B.Tech (Full Time) DEGREE END SEMESTER EXAMINATIONS, April - May 2014

ELECTRONICS AND COMMUNICATION ENGINEERING

VII SEMESTER

EC 9401 - RF AND MICROWAVE ENGINEERING
(REGULATIONS 2008)
Use of SMITH CHART Permitted

Time: 3hour **Max Marks: 100**

Answer ALL Questions
Part A - (2 x 10 = 20 Marks)

1. A 50 Ohms lossless line connects a matched signal of 100 KHz to a load of 100 Ohms. Calculate the voltage reflection coefficient of the load and the position of first V_{min}.
2. Draw the equivalent circuit to explain the behavior of inductor at high frequencies.
3. A GaAs FET has the following S parameters at 6 GHz, $S_{11} = 0.9\angle -60$, $S_{21} = 3.1\angle 124$, $S_{12} = 0.02\angle 62$, $S_{22} = 0.8\angle -28$. Determine the Stability of the transistor.
4. What do you understand by Quarter Wave matching transformer?
5. A matched isolator has insertion loss of 0.5 dB and an isolation of 25 dB. Find the S matrix.
6. Give the principle of micro strip directional coupler.
7. A Reflex Klystron is to be operated at a frequency of 10 GHz, with a dc beam voltage of 300 V, repeller space of 0.1 cm for 1¾ mode. Calculate P_{RF} max, for a beam current of 20 mA.
8. What is meant by "Bunch" formation in TWT ?
9. List the measurement that can be performed by slotted line along with a movable probe detector.
10. Differentiate between loaded Q and Un loaded Q.

Part B - (16 x 5 = 80 Marks)

11.(i)Explain about S – Matrix representation of a multi port network with relevant mathematical treatment. (8)

(ii) Obtain the S parameters for a two port network with mismatched load. (8)

Roll No. [ ]

12.a.(i) Explain the procedure of Microwave Solid state amplifier design. (8)

(ii)A GaAs MESFET has the following S parameters at 5 GHz, with a 50 Ω reference. $S_{11} = 0.5\angle 160$, $S_{12} = 0.1\angle 10$, $S_{21} = 2.0\angle 10$, $S_{22} = 0.4\angle 150$. The source and load impedances are $Z_{sin} = 30\ \Omega$ and $Z_{Lout} = 40\ \Omega$. Calculate G, G_A and G_T. (8)

(Or)

b.(i) Outline the design procedure for Input / Output matching network for a microwave solid state amplifier, using Smith Chart. (8)

(ii)Explain in detail the micro strip line impedance matching with neat diagrams. (8)

13(a)(i) Discuss the operation of a precision phase shifter with relevant mathematical treatment. (12)

(ii) Explain the construction of a microwave attenuator. (4)

(Or)

(b)(i) Explain the principle of IMPATT diode operation with doping profile and field diagrams. (8)

(ii) Brief about mounting and equivalent circuit of IMPATT diode. (8)

14(a)Explain in detail about the two cavity Klystron amplifier with relevant schematic and functional diagrams. Also discuss the mechanism of operation with Applegate diagram. (16)

(Or)

(b)(i) Outline the phenomena of wave propagation in helix slow wave structure with emphasis on beam – field interaction. (8)

(ii)Compare the features of TWTA and Klystron amplifiers. (4)

(iii)A helix TWT operating at 4 GHz under a beam voltage of 10 kV and beam current of 500 mA. If the helix impedance is 25 Ω and the interaction length is 20 cms, find the output power gain in dB. (4)

15(a).(i) Explain the operation of a Spectrum Analyser with a neat block diagram. (6)

(ii) How does a spectrum analyser differ from a Network Analyser? (4)

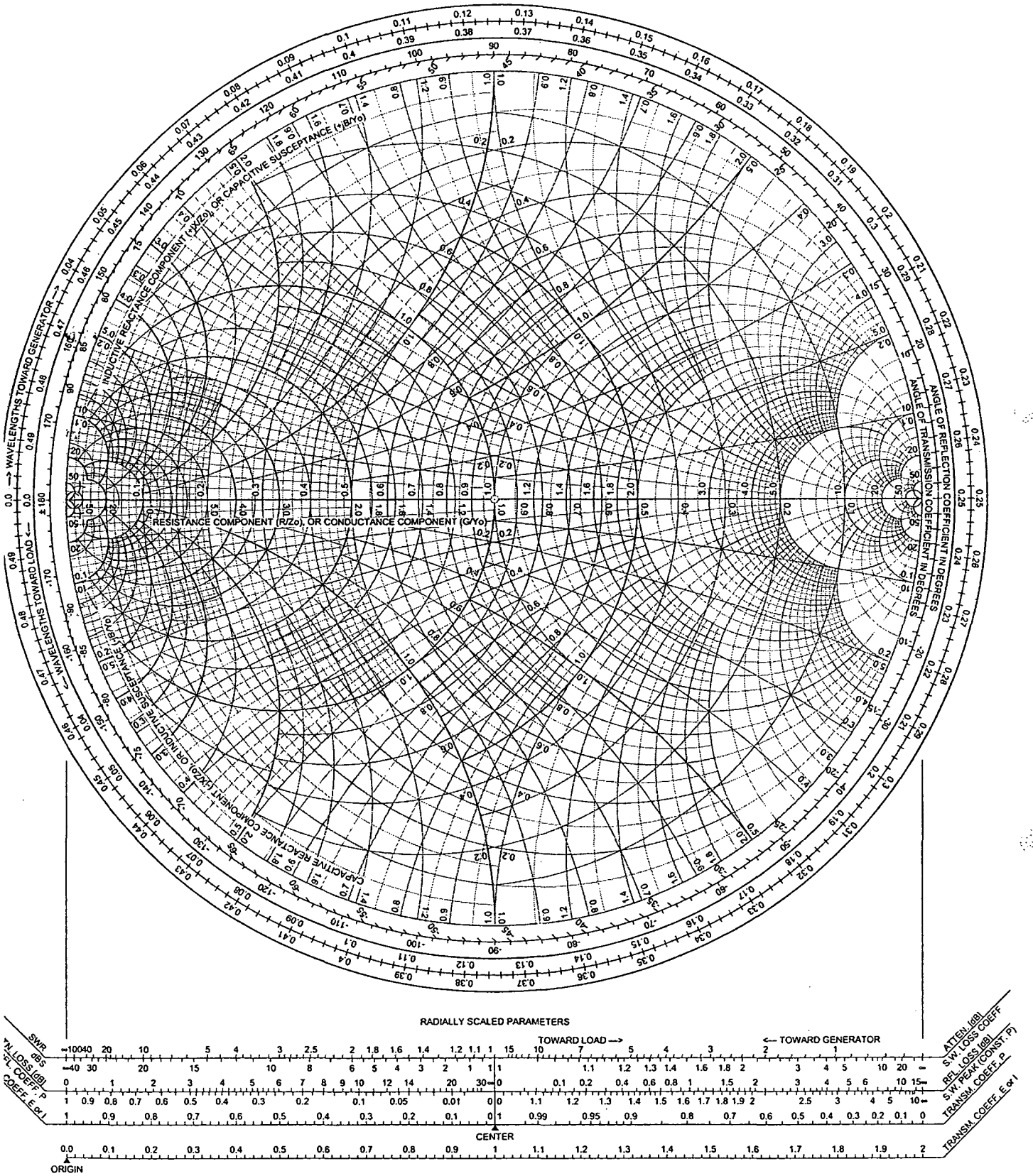
Roll No. | |

(iii)Brief about the principle of microwave power measurement using bridge circuit. (6)

(OR)

(b)(i) Discuss any two methods of impedance measurement at microwave frequencies. (12)

(ii) Write a detailed note on absorption type wave meter. (4)


RESISTANCE COMPONENT (R/Zo), OR CONDUCTANCE COMPONENT (G/Yo)
INDUCTIVE REACTANCE COMPONENT (+jX/Zo), OR CAPACITIVE SUSCEPTANCE (+jB/Yo)
CAPACITIVE REACTANCE COMPONENT (-jX/Zo), OR INDUCTIVE SUSCEPTANCE (-jB/Yo)
ANGLE OF REFLECTION COEFFICIENT IN DEGREES
ANGLE OF TRANSMISSION COEFFICIENT IN DEGREES
WAVELENGTHS TOWARD GENERATOR
WAVELENGTHS TOWARD LOAD
RADIALLY SCALED PARAMETERS
TOWARD LOAD
TOWARD GENERATOR
SWR
RET. LOSS (dB)
REFL. COEFF. P
ATTEN. (dB)
S.W. LOSS COEFF
REFL. LOSS (dB)
S.W. PEAK (CONST. P)
TRANSM. COEFF. P
TRANSM. COEFF. E or I
CENTER
ORIGIN