Roll No.								

B.E./B.Tech (Full Time) DEGREE END SEMESTER EXAMINATIONS, NOV / DEC 2011

ELECTRONICS AND COMMUNICATION ENGINEERING BRANCH

SEVENTH SEMESTER

EC 9401 – RF AND MICROWAVE ENGINEERING

(REGULATIONS 2008)

Duration: 3 Hours **Max.marks: 100**

Answer ALL questions

PART-A **(10x2=20Marks)**

1.Draw the high frequency equivalent of capacitor.
2.List the properties of S-matrix.
3.With the transistor amplifier circuit write the perfect matching conditions.
4.List the steps involved in the design of microwave transistor amplifiers.
5.List out the features of TEDs.
6.A matched isolator has insertion loss of 0.5 dB and isolation 25 dB. Find the scattering coefficients.
7.A reflex Klystron is operated at 5 GHz with dc beam voltage 350 V, repeller spacing 0.5 cm for N = 3 ¾ mode. Calculate the bandwidth over $\Delta V_R = 1$ V.
8.Draw the oscillation region with respect to Hartree condition.
9.Define external Q.
10.Draw the block diagram of down conversion method for frequency measurement.

PART-B **(5x16=80 Marks)**

11.(i)Two transmission lines of characteristic impedances Z_1 and Z_2 are joined at plane PP^1. Express S-parameters in terms of impedances. **(8)**

(ii)State and prove reciprocity theorem for S-parameters. **(8)**

12.(a) (i)Define input and output stability circles and derive the equation for noise figure. **(8)**

(ii)Design a microwave amplifier for maximum transducer power gain. **(8)**

OR

12.(b)(i)Distinguish between T-type matching network and Pi-type matching network **(8)**

(ii)Describe the frequency response and Q of impedance matching network. **(8)**

13.(a)(i)A shunt mounted PIN diode in a TEM transmission line having characteristic impedance of 50 Ω can be represented by a shunt impedance Z = R + jX. Calculate the insertion loss and isolation at a frequency of 2 GHz. The forward resistance $R_f = 0.1$ Ω and capacitance c_j=0.02 pF. **(10)**

(ii)A typical n-type GaAs Gunn diode has the following parameters:

Threshold field	=	2800 V/cm
Applied field	=	3200 V/cm
Device length	=	10 μ m
Doping concentration	=	$2x10^{14}$ cm^{-3}

Operating frequency = 10 GHz

Compute electron drift velocity, current density and negative electron mobility. **(6)**

OR

13.(b)With diagrams explain the working principle of Precision type attenuator and Faraday rotation isolator. **(16)**

14.(a)(i) A helix traveling-wave tube operates at 4 GHz under a beam voltage 10 KV and beam current 500 mA. If the helix impedance is 25 Ω and the interaction length is 20 cm, find the output power gain in dB. **(8)**

(ii)Describe the construction and operation of a basic magnetron. **(8)**

OR

14.(b) Explain the density modulation and operation mechanism of two cavity klystron amplifier. **(16)**

15.(a) With block diagrams explain the operation of spectrum analyzer and network analyzer. **(16)**

OR

15.(b) Explain the method for high power microwave measurement and set-up for S-parameter measurement . **(16)**
