Reg. No. : ☐☐☐☐☐☐☐☐☐☐☐☐

Question Paper Code : 31378

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2013.

Seventh Semester

Electronics and Communication Engineering

EC 2403/EC 73/10144 EC 703 — RF AND MICROWAVE ENGINEERING

(Regulation 2008 / 2010)

(Common to PTEC 2403 — RF and Microwave Engineering for B.E. (Part-Time)
Sixth Semester Electronics and Communication Engineering - Regulation 2009)

Time : Three hours   Maximum : 100 marks

Smith chart is to be provided.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Draw the equivalent circuit of an inductor at radio frequency.

2. What is ESR?

3. Define transducer power gain.

4. Give the expression that relates nodal quality factor (Q_n) with loaded quality factor (Q_L).

5. What are the composition of ferrite?

6. What is Gyrator?

7. What is a step recovery diode.

8. Mention the ideal characteristics of dielectric material in MMIC.

9. Distinguish between TWT and Klystron.

10. Define SWR.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Write a detailed note on ABCD parameters. (8)

(ii) The input of an amplifier has a VSWR of 2 and the output has a VSWR of 3. Find the magnitudes of the S-Parameters S_{11} and S_{22} under matched condition. (8)

Or

(b) (i) A four port network has the scattering matrix shown below.

$$[S] = \begin{bmatrix} 0.1\underline{|90°} & 0.6\underline{|-45°} & 0.6\underline{|45°} & 0 \\ 0.6\underline{|-45°} & 0 & 0 & 0.6\underline{|45°} \\ 0.6\underline{|+45°} & 0 & 0 & 0.6\underline{|-45°} \\ 0 & 0.6\underline{|45°} & 0.6\underline{|-45°} & 0 \end{bmatrix}$$

(1) Is this network lossless?

(2) Is this network reciprocal?

(3) What is the return loss at port 1 when all other ports are matched?

Justify your answer. (10)

(ii) Find the Z parameters Z_{11} and Z_{22} of the two port T-network shown in figure 11 (b) (ii). (6)
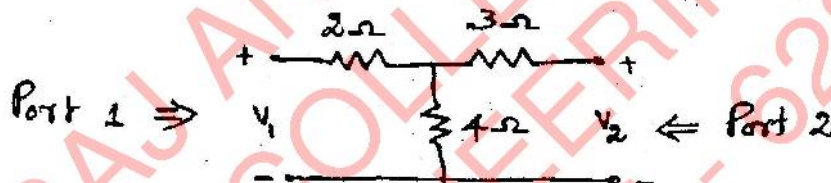

Figure 11 (b) (ii)

12. (a) (i) A MESFET operated at 5.7 GHz has the following S-parameters :
$S_{11} = 0.5\underline{|-60°}$, $S_{12} = 0.02\underline{|0°}$
$S_{21} = 6.5\underline{|115°}$, $S_{22} = 0.6\underline{|-35°}$

Verify the circuit, whether it is unconditionally stable or not? (6)

(ii) Write brief note on :
(1) Operating power gain (3)
(2) Available power gain (3)
(3) Noise figure. (4)

Or

(b) Discuss the design procedure for T and π matching networks.

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13. (a) Describe the following with neat sketch

    (i)   Magic Tee   (8)

    (ii)   Directional coupler.   (8)

Or

(b) Explain the operation of following microwave passive devices.

    (i)   Circulator   (8)

    (ii)   Isolator.   (8)

14. (a) Explain the principle of operation of Tunnel diode and TRAPATT device.

Or

(b) (i) Describe the Gunn effect with the aid of Two-valley model theory.

                                                 (8)

    (ii) Draw the physical structure and doping profile of IMPATT diode and explain in detail.   (8)

15. (a) Explain the working principle of Reflex Klystron and derive the expression of bunching parameter.

Or

(b) (i) Write a detailed note on cylindrical magnetron.   (8)

    (ii) Explain the procedure for measuring impedance at microwave frequency with the aid of slotted line.   (8)

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